No. 1872 Vol. XLVI NOVEMBER 9th, 1944

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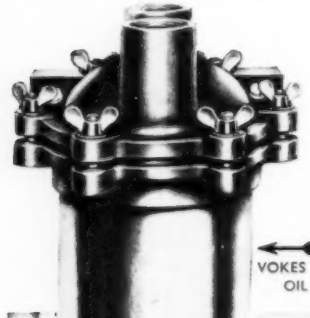

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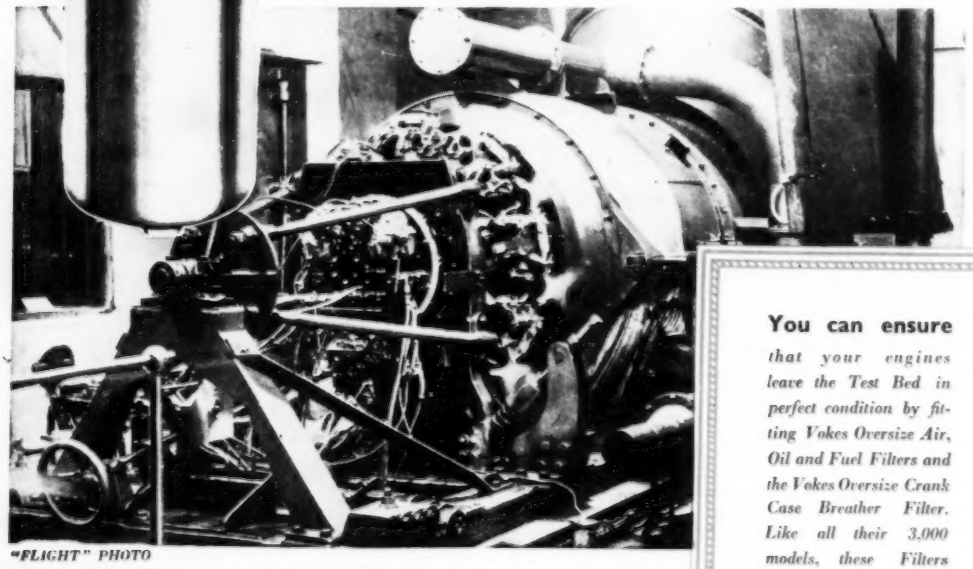

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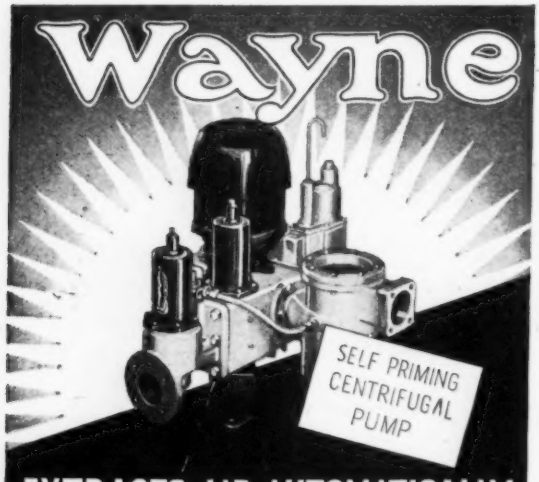

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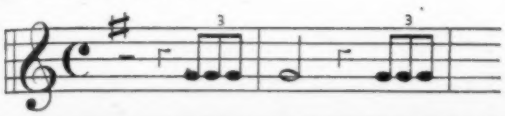
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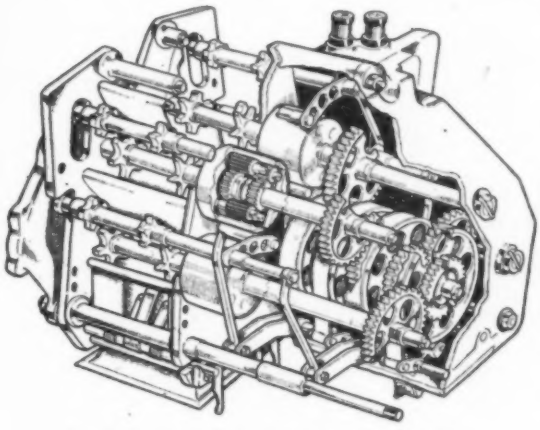

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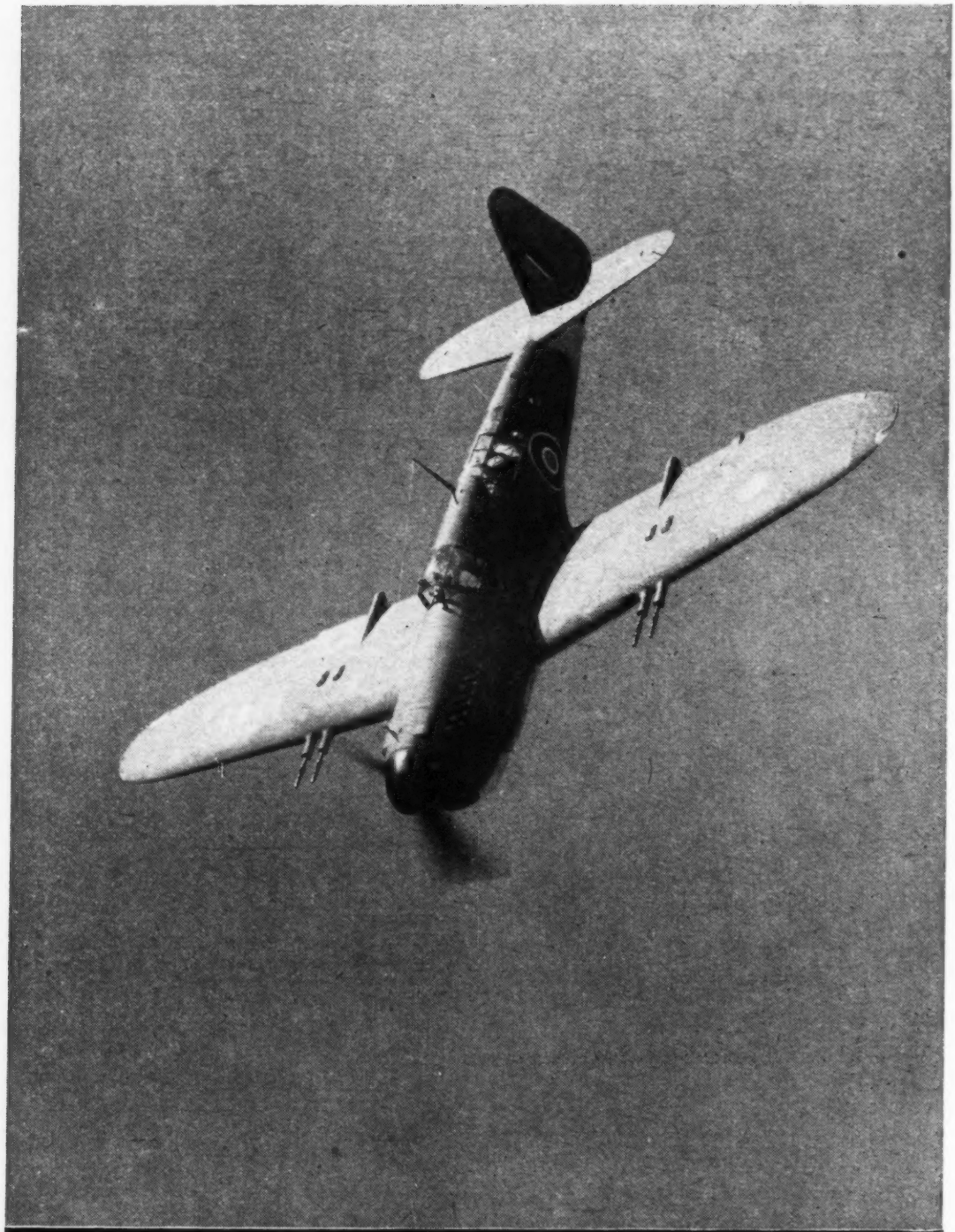

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FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

Overlooked

ALL branches of the Royal Air Force are doing such fine work every day and all day that there is a danger that the nation may become blasé. When the incredible is achieved time after time, and for a sufficiently long period, it ceases to be incredible and is accepted as "Just a Part of the R.A.F. Service," to paraphrase a familiar advertisement. That in so many of its operations the Royal Air Force has to strain aircraft and crew to the utmost is too often overlooked entirely, or at any rate insufficiently appreciated.

A very good illustration was afforded by Bomber Command's attack on the *Tirpitz* in a Norwegian fiord near Tromsö on the night of October 29th. Generally speaking, the Press did not make a great deal of this amazing operation. It naturally expressed pleasure that the German battleship had been hit again almost as soon as she was shifted from Kaa fiord to an anchorage off Haakoy island, but the magnitude of the task was not stressed. Yet the operation was one of the most astounding ever executed by the Command under Air Chief Marshal Sir Arthur Harris.

From the technical aspect no less than from the human, the operation was a great achievement. The Lancaster bombers must have been carrying a considerable overload in order to be able to cover 2,400 miles each with a bomb load of 12,000 lb. Not only must the take-off have been difficult, but the Rolls-Royce Merlin engines must have had to be kept running at somewhere near normal full power for the whole of the outward flight. That the task could be even contemplated, let alone achieved successfully, shows the faith which the R.A.F. and the Rolls-Royce engineers have in the Merlin, for it is to be supposed that the makers were consulted before an operation was undertaken which made such calls on the engines. The Merlins certainly demonstrated that they can "take it," even when pressed beyond anything that might reasonably be expected.

We onlookers can only marvel and say "Well done, Bomber Command; well done, Avro; well done, Rolls-Royce."

Bombs and Battleships

TWO air attacks on battleships, on opposite sides of the world, have produced diametrically opposed results. In the Norwegian fjords the *Tirpitz* gets a direct hit from a 12,000 lb. bomb, yet remains on the surface. In the recent naval air battle off the Philippines carrier-borne aircraft of the U.S. Navy, using no bombs weighing more than 2,000 lb., sink two Japanese battleships in addition to a large number of other warships. Why is this?

To understand the apparent discrepancy it is necessary to bear in mind what is required to sink a battleship—especially a modern vessel such as the *Tirpitz*. All the vitals are more or less wrapped in armour plate, which may vary from one to many inches in thickness, and compartmented in such a way as to minimise the effect of an explosion. In fact, it can be said that no one explosion, except an exceedingly fortunate direct penetrative hit in a magazine—such as that which sank the *Hood*—could put a battleship under. What is required is a number of below-water—or what are termed "wet"—hits. This is where the airborne torpedo has its particular use.

In the Philippines doubtless the Americans carried out concerted operations with high-level precision bombing and torpedo attacks. The bombing would have the effect of a severe anti-*flak* attack by smashing up fire-control apparatus and between-deck machinery. At this stage the torpedo aircraft can attack with reasonable

losses and score the requisite number of under-water hits. The two Japanese ships were both pre-1914 vessels, and in an air-fleet action it is almost impossible to employ a smoke screen effectively because the ships run out of it in a very short while. Thus their sinking is accounted for.

Now as to the *Tirpitz*. Mountains, torpedo-net defences, and the almost enclosed waters preclude the employment of airborne torpedoes. As the vessel is stationary, a continuous smoke screen can be maintained. Extra anti-aircraft guns mounted on land make an exceedingly "hot" target, impossible of close approach. In these days of radiolocation there is no such thing as real tactical surprise, and it is to be expected that all these defences are in full working order by the time our bombers arrive. How, then, can the requisite number of vital hits be made? Certainly, remembering all the defences with which the air attack has to contend, it is not reasonable to expect a sufficient number of direct "dry" hits and penetrations through the main armour plate. What *can* be expected is a considerable number of near-misses and, if the right type of bomb and fuse has been selected, sufficient under-water damage to necessitate dry-docking for a long time. If bombs of this type were employed, it is obvious that they would have practically no penetrative effect on armour plate in a direct hit. Thus arises the paradox that it is better to miss the target than hit it. It seems fairly certain from this reasoning that non-armour-piercing bombs were employed, and only future movements of the *Tirpitz* will show whether the attacks have had the desired effect.

Getting Things Straight

IN the inter-war years Britain committed many sins of omission, and not the least heinous was the failure to work out plans for the combined use of the Army and the Air Force. This had to be made good in the stress of war, and the man above all others who solved the problem was Air Marshal Sir Arthur Coningham. He did it in Africa, and so wonderfully successful was the work there of the 1st Tactical Air Force that Sir Arthur was brought back to Britain to take command of 2nd Tactical Air Force.

At first this was a subordinate command, forming part of the Allied Expeditionary Air Force, of which Sir Trafford Leigh-Mallory was the A.O.C.-in-C. The other components of the A.E.A.F. were the U.S. 9th Air Force, which had also been brought up from the Mediterranean theatre, and A.D.G.B. The last-named has now become Fighter Command, and its head, Air Marshal Sir Roderic Hill, has gone up from A.O.C. to A.O.C.-in-C. It is only fitting that a similar rise in dignity should fall to the lot of Sir Arthur Coningham, and accordingly he has now become A.O.C.-in-C. He has also been given administrative control of all R.A.F. units in N.W. Europe.

The link between the 2nd T.A.F. and the American 9th A.F. is the Deputy Supreme Commander, Air Chief Marshal Sir Arthur Tedder, who commands both, in addition to his other duties.

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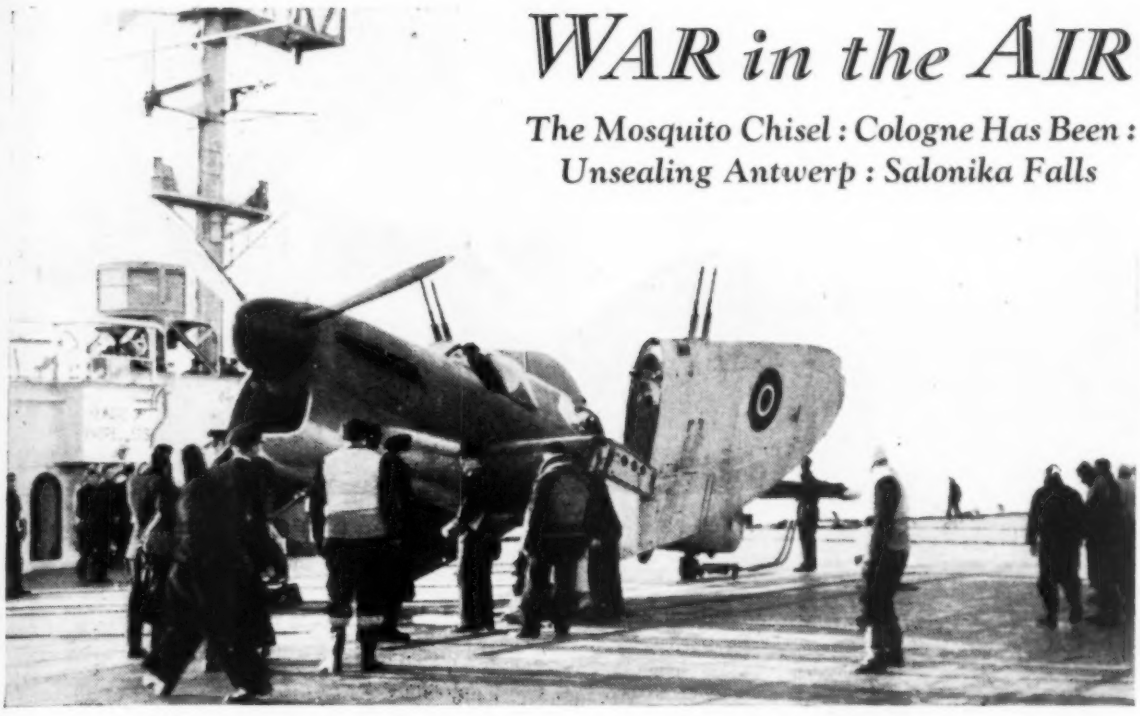
FLEET'S FLEETEST: The Fairey Firefly two-seater fighter which is the latest addition to the Royal Navy's range of aircraft. Description and photographs appear on pages 496-497, 500, *a* and *b*.

WAR in the AIR

The Mosquito Chisel : Cologne Has Been : Unsealing Antwerp : Salonika Falls



F.A.A. LATEST : A Fairey Firefly, with folded wings, on the flight deck of H.M.S. *Pretoria Castle.*

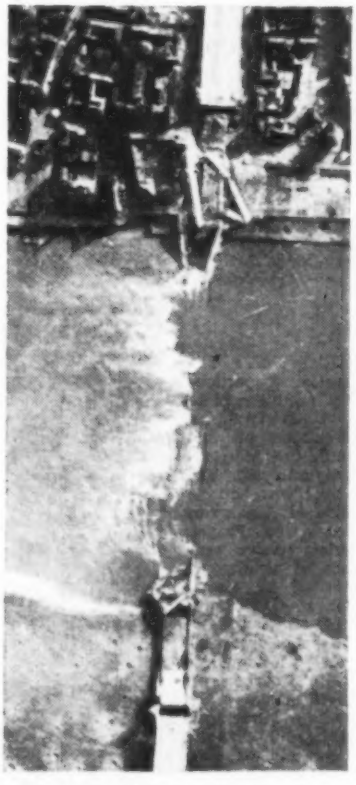
SOME time ago (a couple of years, if our memory is correct, without looking up records) Mosquitoes made their first public appearance by bombing the headquarters of the Gestapo in Oslo in broad daylight. Since then this remarkable De Havilland type has given other demonstrations of its powers to chisel out some special target without causing damage to neighbouring structures which were of a friendly nature. Only a couple of weeks ago the same type was entrusted with the delicate task of bursting open the gaol at Amiens with the utmost nicety. The bombers had to break down the outside wall at more than one place, make holes in the main building so that the inmates could get out, and at the same time blow up the German guards in their quarters—and all this without hurting the prisoners inside.

Last week another feat of almost equal delicacy was entrusted to 24 Mosquitoes. This was the destruction of the Gestapo H.Q. in Aarhus in Denmark. The offices were located in two buildings in the middle of the University, and the neighbouring buildings had been turned into hospitals. Such a task would have seemed easy to the *Luftwaffe*. They would merely have tried to blot out the whole area, hospitals and all. Not so the 2nd Tactical Air Force. They were naturally ordered to take the greatest pains to avoid all chance of damaging the hospitals. That, of course, meant that the R.A.F. pilots had to take special risks, flying low and slow.

They went in in four sections of six machines each, while a photographic machine hung round to record the results. There seems no doubt that both the Gestapo buildings were well and truly destroyed. In those buildings were housed the Gestapo records, which would enable the organisation to seize such Danes as they considered dangerous. Most of those papers were, it is hoped, destroyed; and it may also be hoped that a goodly contingent of Gestapo villains were in their offices when the bombs fell. The raid only took ten minutes, and all the Mosquitoes returned home. Some *flak* was encountered, but no fighters appeared.

Cologne was, if not the first, certainly in the first three German towns to receive attacks by 1,000 bombers at a time. Survivors of that first occasion, if any are still left in the place, must look back on it as a nice quiet night when not much harm was done. R.A.F. bomber crews, on the other hand, probably look back on those bad old days as meaning long journeys through endless *flak* to reach a far-away target. Cologne is now only a few miles behind the American battle line. The flight to reach it is just as far in miles, but most of it is over country now occupied by the Allied armies, and the journey there and back is mostly unexciting.

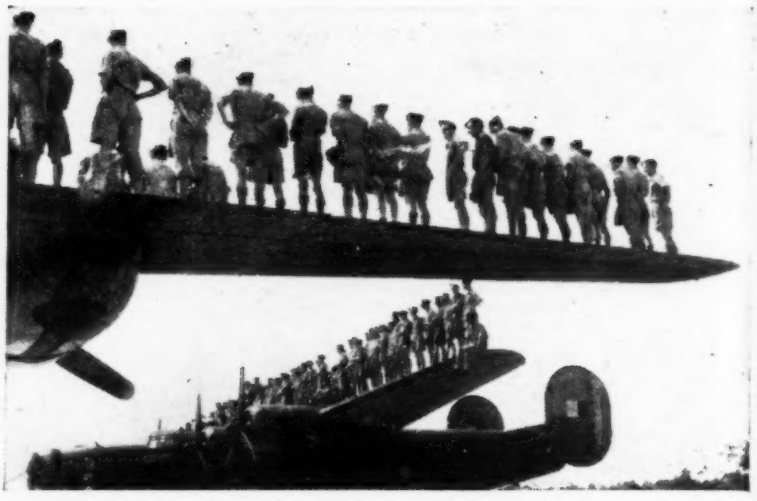
Being so close to the battle, Cologne acquired a new importance. The city became, not merely a manufacturing centre whose products might reach the German armies in some six months or



TRAFFIC SUSPENSION : All that remains of the Cologne suspension bridge after the R.A.F. Bomber Command attack on October 28th last.

WAR IN THE AIR

so, but an important base which could send its new output direct up to the forces struggling to maintain *Die Wacht am Rhein*, and was also a convenient repair shop for damaged tanks and suchlike. Altogether it was felt that the time had come to remove Cologne entirely from the map. The necessity was, of course, regrettable. Every lover of what Cranwell calls humanistic studies would wish the famous cathedral to be preserved; and, moreover, Cologne has a long history which commands respect. Its very name is a derivation from the Latin *Colonia*, meaning colony or civilised settlement. But as the surroundings are no longer civilised, but connect with the modern Hun, that link with the past no longer commanded the same respect.



FEET PER SQUARE FOOT: Ground crews use Liberators of the R.A.F. Strategic Force in India as a grandstand to watch their aircraft return from a 2,100 miles' flight to bomb a rail junction near Bangkok.

So Sir Arthur Harris and Gen. Spaatz set about Cologne by day and night, and when they had done with it the destruction was quite as widespread as that wreaked on Hamburg some time ago. In fact, for all practical purposes, Cologne has ceased to exist. The Germans may put up a board saying "Here was Cologne" as they used to delight to do when they had obliterated some harmless village in Czechoslovakia or Poland. To the German armies round about Aachen the loss will be very bitter.

The Fight for Walcheren

THE railways from Normandy up to the rear of the Allied front in Holland have now been got into some sort of order, and in consequence the supplies for the front line are getting up fairly well. But it is eagerly desired to make use of Antwerp, as sea transport is the most efficient of all when preparations have to be made for a major attack.

So there has been intense fighting to clear the Germans out of the lands which govern the sea approaches to Antwerp. The breaching of the dykes round Walcheren did not swamp all the German gun positions, which were on higher ground. It remained for the Army, supported by the Navy, to complete what the Air Force had skilfully begun. The Canadians undertook a grim assault along the causeway which connects Beveland with Walcheren. Their difficulties and hardships were great, for the only cover from the German fire was to be found by hiding in waterlogged holes.

Meantime British troops crossed over to Flushing by boat, covered by gunfire from the captured village of Breskens, and a week ago the German radio announced that Flushing was in British hands. Another landing by Royal Marine Commandos was made at Westkapelle, and this was covered by the guns of warships. The landing craft actually sailed through the breaches in the dykes made some time ago by our heavy bombers, and the Marines proceeded to fight their way in both directions along the remaining dykes. The operation was preceded by attacks by light bombers, which put many of the German gun positions out of action. So once more we have seen the advantage of combined operations by the three Services.

Bomber Command and the U.S. 8th Air Force have found out where the remaining *Luftwaffe* fighters are located. Their job now is evidently to defend the remaining sources of

NICE WORK: The story of a particularly accurate piece of bombing by Mosquitoes of 2nd T.A.F. has been recently released. The attack was on a prison at Amiens to release 100 French patriots under sentence of death. It was led by Group Capt. P. C. Pickard, D.S.O. and two Bars, who was unfortunately shot down. The photograph on the right shows the low-level attack in progress and the one above is of the breach in the south side of the prison outer wall.

WAR IN THE AIR

German oil, and in the effort to accomplish this they have evidently been instructed to disregard everything else. In an attack by a large force of Fortresses and Liberators on the synthetic oil plants at Leuna and Merseburg some 400 German fighters went up to attack the bombers, and a great air battle ensued. The Americans had an escort of over 900 Mustangs and Thunderbolts, and it is claimed that 208 German aircraft were destroyed in the air and on the ground. The Americans lost 41 bombers and 28 fighters, but some of the latter are believed to have landed in friendly territory.

Naval Aircraft

WHILE everyone admires the use which Admiral Nimitz is making of his carriers and their aircraft in the Pacific, it is always interesting to note the performances of British carriers off the coast of Norway. These operations provide excellent practice for an arm which must be destined to make its mark in the coming final struggle against Japan.

The Admiralty has announced yet another raid against German shipping off Norway, this time in the neighbourhood of Bodo, where six enemy ships were sunk, among them being a tanker and an aircraft tender.

The Fleet Air Arm has recently been strengthened by a new fighter, the Fairey Firefly. The name recalls a beautiful little biplane produced by the Fairey firm in 1929, which was adopted as standard equipment by the Belgian Air Force. The new type is a low-wing monoplane two-seater, driven by a Rolls-Royce Griffon engine. Machines of this type took part in the latest naval attack on the *Tirpitz*, engaging enemy aircraft which tried to interfere.

GHOST PLANE : A Vickers Warwick, complete with turret-front, dorsal and tail—in the white paint camouflage of Coastal Command. The engines are Pratt and Whitney 2,000 h.p. Double Wasps.

Since the first part of this article was written reports have been received from Danes in Sweden which show that our hopes about the house at Aarhus were not in vain. They say that 125 Gestapo men were killed, including the chief of the organisation in Jutland, Herr Schwitzgebl, and 40 more were wounded.

It is most gratifying to learn that gallant little Greece is now clear of all German occupation. British troops have entered Salonika, and have found that the Germans had quitted, but had done a lot of wrecking in the harbour before they left. The Navy now has parties which are experts at clearing harbours in record time, for they had a lot of experience in Libya. The Balkan Air Force has been looking for the retreating Germans, but the latter had got a very good start.

The transfer of Air Chief Marshal Sir Trafford Leigh-Mallory to South-East Asia Command has been promptly followed by a similar transfer of General Sir Oliver Lesse, who is going to command an Army Group in Burma. He will be remembered as the successor to Sir Bernard Montgomery in the command of the 8th Army, which he has led with great skill all the arduous way up to the Gothic Line in Italy. These things foreshadow serious business in Burma before long. Another incident which points in the same direction was the bombing of the Japanese installations in Singapore docks by Super-Fortresses based in India. It was the longest daylight raid yet undertaken by military aircraft.

PIRATES' LAIR : U.S. Navy Corsairs running-up their engines on a palm-fringed airfield.

A.T.A. BENEVOLENT FUND

THE total of outside contributions to the above fund up to October 17th last was £9,971 1s. 1d., and we are happy to record the amounts subscribed since our last list was published in August.

Already acknowledged ..	£9,892	17	1
Subscriptions by A.T.A. and B.O.A.C. members	4,102	1	6
	£13,994	18	7
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I. C. Geddes.....	10	10	0
Miss M. Hoome (Glasgow)	5	5	0
Miss C. R. Leathart (Morpeth)	5	0	0
Anonymous	3	0	0
Major Boycott (The Suffolk Regt.)	2	2	0
M.A.P. Light Metals Control	2	2	0
Miss J. M. Smith (Aldershot)		5	0
	£14,073	2	7

HERE AND THERE

From B.O.A.C. to D.H.

MR. A. F. BURKE, until recently deputy director-general (technical) of B.O.A.C., has now joined The de Havilland Engine Co., Ltd., as general manager with a seat on the board of directors.

Swift Survey

A MOSQUITO of R.A.F. Transport Command recently flew from England to El Adem, near Tobruk, in 5½ hr., an average speed of 335 m.p.h. It was piloted by Wing Cdr. F. A. Aikman, D.F.C., with Flt. Lt. C. F. Cutting, D.F.C., D.F.M., as navigator.

Westland Changes

RECENT changes announced in the directorate of Westland Aircraft are as follows: Mr. John Fearn becomes managing director in place of Mr. Eric Mensforth, who has been elected vice-chairman, while Messrs. Arthur Davenport, chief engineer, and E. C. Wheeldon, works manager, have been elected to the board of directors.

U.S. Technical Mission to U.K.

BY way of a return visit for the British Technical Mission which visited America in May last year, a similar mission is visiting Britain from the U.S. The purpose is to study British industrial aircraft standard parts, practices, and materials in an effort to bring about uniformity of standards in the aircraft industries of the two countries.

The U.S. mission will spend four or five weeks here as guests of M.A.P. and the S.B.A.C., and will spend several days at typical aircraft centres and maintenance bases.

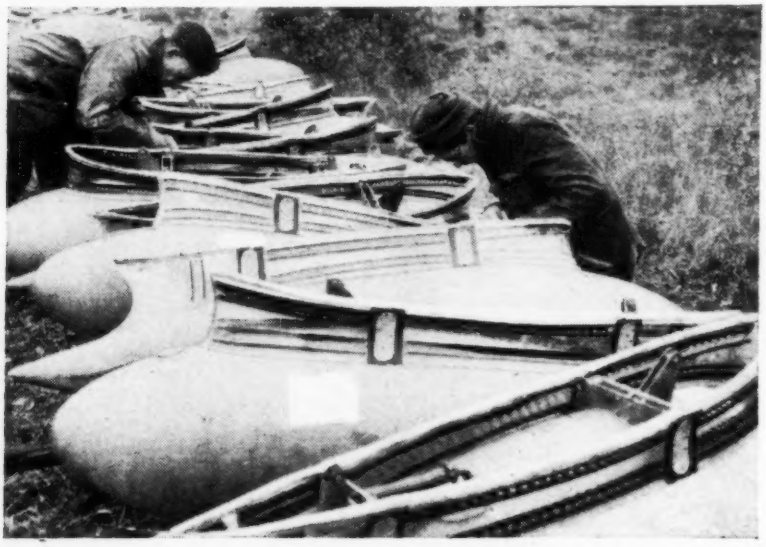
"OUT OF EVIL——": This flying bomb on show at Rootes' exhibition in Piccadilly is now helping a good cause (as described below). Beside it is Max Millar's drawing from *Flight*.

Bombs and Boys

THE exhibition now open to the public in the showrooms of Rootes, Ltd., Devonshire House, Piccadilly, London, is well worth a visit. It gives a clear picture of the co-operation of the different Services in beating the flying bomb. The plotting room at work gives a good idea of how the bombs were tracked and attacked, and a cine film showing bombs being hit by ack-ack is a real thriller.

A real (but not "live") flying bomb is on view, and an enlargement of Mr. M. A. Millar's drawing from *Flight*, which shows the interior details.

The exhibition is being held to raise funds for the London Federation of Boys' Clubs (of which there are some 300). Headquarters of the Federation is at 222, Blackfriars Road, London, S.E.1, and all donations, other than those made at this exhibition, should be sent to the hon. treasurer at that address.



DEEP DEPRESSION OVER GERMANY: The "Tempest" can spread itself much further over Germany with the aid of these long-range fuel tanks, snapped on an advanced airfield in Holland.

Airline Personnel

WE have been asked by Sir Roy Fedden to publish the following letter, which arrived too late to be included on our Correspondence page:—

"Press reports on the recent discussion on civil aviation arranged by the Royal Aeronautical Society gave wide publicity to certain remarks [not reported by *Flight*—ED.] made by the Director-General of the British Overseas Airways Corporation; remarks which contained some unfortunate comments on American airline personnel which we consider unfounded and hardly likely to help that close and happy relationship for which everyone in aviation on both sides of the Atlantic is striving.

"The Council of the Royal Aeronautical Society specifically state always that the Society is not responsible for any expression of opinion at any of their meetings, and on this occasion they wish to emphasise that statement and publicly to dissociate themselves from the comments made on American airline personnel—comments which, following the extensive experience of many of the Council of travelling on American airlines, are unjustified and likely to be misunderstood by our American friends."

(Signed) ROY FEDDEN
(President of the R.Ae.S.).

Gas-turbine Comes to Stay

"THOUGH it will necessarily be some years before the gas turbine is fully established, it has come to stay."

Thus Air Comdre. Frank Whittle on the recent occasion of his being presented with the Freedom of Leamington; he was

HERE AND THERE

educated at Leamington College, and the casket containing the scroll was made of old oak from a building in blitzed Coventry—his birthplace.

Saying that he had always hoped the products of his work would do more to serve the causes of peace than the purposes of war, Air Cmdre. Whittle added that he had derived great pleasure from the fact that the first use of the jet-propelled fighter had been to save life by destroying flying bombs.

A.T.C. Cadet's B.E.M.

THE KING has approved the award of the British Empire Medal to A.T.C. cadet Leonard Wells, of Egremont, Cumberland, for his gallant rescue of a pilot from a burning aircraft which crashed near where he was at work on a farm. Wells's prompt action in climbing on the wing of the blazing machine, dragging the pilot from the cockpit and tearing off his burning parachute and clothing, undoubtedly saved his life.

Wells is the first A.T.C. cadet to win the B.E.M.

All Wright!

MR. T. P. WRIGHT, of the Curtiss-Wright Aircraft Corporation, is to give the 33rd Wilbur Wright Memorial Lecture before the R.Ae.S. on May 31st next year.

"T. P.," one of the best known men in American aviation, was recently appointed Administrator of Civil Aeronautics, having previously been Director of Aircraft Resources Control Board of the U.S. War Production Board.

He is an Honorary Fellow of the R.Ae.S., but is not a member of the Wright Brothers family, as many people rather naturally imagine him to be.

U.S.-Scandinavia Service Planned

AN air service between Scandinavia and the U.S. is being planned and will be operated jointly by Norway, Sweden and Denmark in agreement with the U.S., according to a recent statement made to C.A.B. in Washington.

Mr. Frederick Melchier, vice-president of Midnight Sun Airlines Inc., told the board that the American Government would like to have such a service, and that the fare between New York and Stockholm would be $350, which is about £87.

Record Circulation

A SQUADRON of U.S. "Forts and Libs" has dropped 908,000,000 leaflets within twelve months, mostly by night, on Norway, Denmark, Germany, Holland, Belgium and France, it was recently reported. They represent some 1,700 tons of paper.

This sort of "record net sales" of special overseas editions should impress even the biggest national dailies, especially as the war news they contained invariably scooped the German papers.

The leaflets were usually written and printed just before the bombers took off.

To Keep Their Hands In

A RECENT issue of the Swedish newspaper *Dagsposten* takes up the question of Danish refugee airmen operating with the Swedish Air Force, and publishes an interview with Maj. S. G. E. Adolfsson of that Force.

Confirming that there are about ten Danish officers residing with the Swedish Air Force, the major says they are at all times under the supervision of an officer specially appointed for this purpose, whose duty it is to see that no military secrets are revealed to their visitors.

The main purpose of the Danes' presence, he adds, is to enable them to continue training in order to keep their hands in—it is purely an humanitarian measure.

THE TURKISH AMBASSADOR, M. Rusen Esref Unaydin, recently presented wings to a flight of 50 Turkish cadets undergoing training as pilots with the R.A.F. They will remain at the R.A.F. Flying Training Command for advanced fighter and bomber-type training.

"....and so, gentlemen, our special commission after nearly three years of intense research, has decided that such a design should be eminently suitable for the first ten years of post-war civil aviation."

SKY HOOK: Lt. Col. V. Stewart and his new 65-lb. container which spirals down with supplies more accurately than a 'chute.

Anglo-American Airliner

TRANS-CANADA AIRLINES has completed arrangements for the use of what they claim will be the most advanced transport aircraft in the world in post-war civil aviation.

A high official of the company said the American-designed DC-4, now under production in Canadian factories, when equipped with Rolls-Royce engines manufactured in Britain, would be equivalent to the DC-6, which U.S. companies are planning to use.

The important fact from the viewpoint of the relative positions of the U.S. and Canada in this field is that the DC-6 will not be available for two or three years. Its Canadian equivalent will be ready within a year.

All's Fare in Air War

PERHAPS something sane will eventually emerge as a result of the Chicago conference, but at present there seems to be all the makings of a first-class price-war in Transatlantic post-war passenger fares, even among the American companies themselves.

T.W.A. has recently applied to C.A.B. for four daily flights between America and Europe, quoting a single fare to London of $205 (about £51). This follows on the announcement of a New York-London fare of $235 (about £59) by American Airlines Inc., and a cut-price fare of $148 (about £37) by Pan-American Airways for the same journey.

In between these is the proposed Prestwick-New York return fare of £80 (equivalent to a single fare of £40) by Scottish Aviation, as reported in last week's issue of *Flight*.

It now remains to be seen what B.O.A.C. propose to do about it.

The FAIREY FIREFLY

Old Name Revived in New Type : Both Have Seen Service in This War

AVIATION is young enough in years for many "first" claims to be made, but it is probably unique to find two aircraft of the same name made by the same firm operating in the same war. This is the fact, for some years before the war the Fairey company produced a fast single-seater fighter also named the Firefly. This original machine, a "private venture" model of 20 years ago, was a biplane powered by a Fairey Felix engine of 460 h.p. An improved version, the Firefly II, was equipped later with a Rolls-Royce Kestrel engine, and this and later models were sold abroad to several foreign governments. Included in these was the Belgian government, and thus the Firefly biplane put in a brief appearance in the opening days of this war. The top speed of this Firefly was 220 m.p.h., and a Fleet Air Arm version, the Firefly III, was also produced in small numbers. The Firefly IV in the Belgian Air Force could climb to 23,000 feet in 10½ minutes, and had a service ceiling of 29,520 feet when powered by a Hispano-Suiza engine of 785 h.p. It would not require much for an expert to guess some of the particulars of the new Firefly with fair accuracy, and it may therefore be of interest to note that the old Firefly had a gross weight of 3,400 lb. and a wing loading of 12.5 lb./sq. ft. These figures are a pointer to the amazing march of aviation in less than ten years, and perhaps a justification for the optimistic announcements concerning the aircraft of 1950.

The present Firefly is a monoplane of conventional low-wing design. It has, as the potted Admiralty statement reveals so long after the event, been blooded in action against the battleship *Tirpitz* and the land defences protecting that long-harried ship.

In its initial action it behaved like a thoroughbred, and responded to the swift manœuvres of battle flying as sweetly as to the more circumspect handling it had received at test and development land bases. It is powerfully engined with a Rolls-Royce Griffon and may be presumed to have a very satisfactory top speed which, in conjunction with long-proven armament, would make it capable of dealing with any air opposition short of the fastest single-seater fighters.

The translation of the staff tactical ideas into flying form is the normal headache accepted by the design company and the technical personnel of the Navy installed in the Ministry of Aircraft Production under Cmdre. Slattery, R.N. Contrary to the widely accepted belief, the chief worry is how to get off the deck rather than how to land-on. This major factor has debarred many good aircraft from consideration for naval flying, but in the new Firefly the Griffon engine has solved this difficulty. But there were other knotty problems. The excellent engineering feat in cutting the wings of the original style of Spitfire to make the complicated double-fold of the Seafire Mark III seems all the more intricate on viewing the Firefly's wing-folding arrangements. The internal mechanism is a masterpiece of ingenuity and possibly a production engineer's nightmare, but the net result is that the wing folds sweetly and efficiently.

Other standard features in naval aircraft are found in the Firefly. Spools for catapult launching and deck arrester apparatus are trimly installed, whilst from the front cockpit the pilot has a clear view of the batsman when landing-on.

Group Production

The Firefly follows a growing practice in production methods in that it is produced on the Group system as already in being with the Lancaster, Halifax, Mosquito, Swordfish, Barracuda and Seafire. Directly assisting the parent Fairey company are General Aircraft and Aero Engines, Ltd., whilst partners in this production pattern comprises hundreds of major and minor sub-contractor firms. This system is working well. Attention may be drawn to the fact that many naval types require up to 60 per cent. spares in view of the need of carriers to go to sea as completely equipped for running repairs and maintenance and replacements as possible.

Probably the most interesting feature of the new Firefly is the provision of special flaps which, when not in use, nest snugly in a recess on the underside of the wing and thus produce no drag in normal flight. The actuation of

the flaps is hydraulic, as are most services on the machine, and although there is no direct mechanical linkage between the flaps, in operation they are perfectly phased. The hydraulic system for the whole machine is by Lockheed.

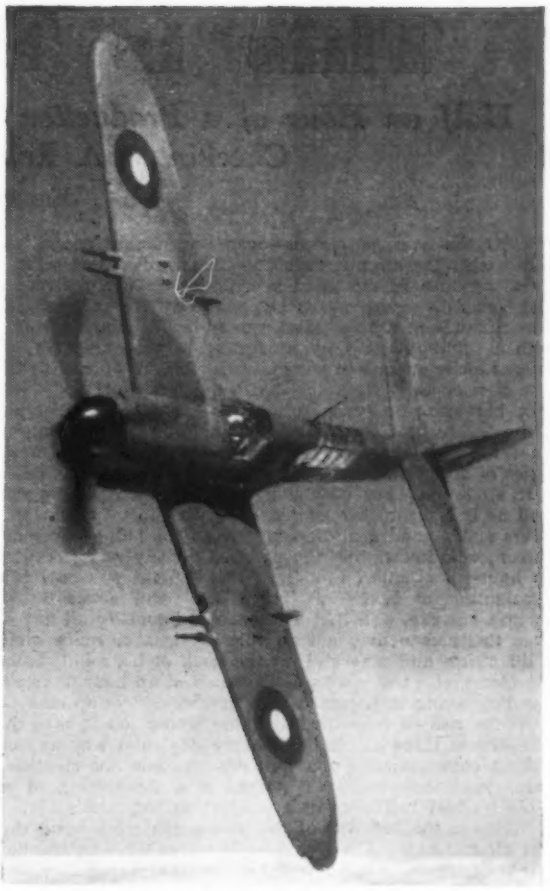
The combination of a "clean" aircraft with a Griffon engine and these special Youngman flaps has resulted in the successful production of an aircraft which embodies the desirable characteristics of both a Swordfish and a Seafire. With the flaps in the cruising position the aircraft can fly along very, very slowly indeed, making really tight turns in an unbelievably small space; on the other hand, with flaps retracted it takes on the qualities of a single-seater fighter and climbs upstairs like a shell. Seeing one of these Fireflys stooging around at what looks to be about 50 m.p.h. and then seeing it beating up like a Spitfire or Tempest really makes one begin to doubt that it is the same machine.

The new Firefly is by no means a small aircraft. The wings in plan form are reminiscent of the Spitfire, and with a span of 44ft. 6in. they house four 20 mm. cannon—two in each wing. For carrier operation, wing folding is essential, and the way in which the Firefly's wings fold is very ingenious indeed; particularly good is the arrangement of control linkage at the folding hinge line, and also the very simple locking arrangement when the wings are spread.

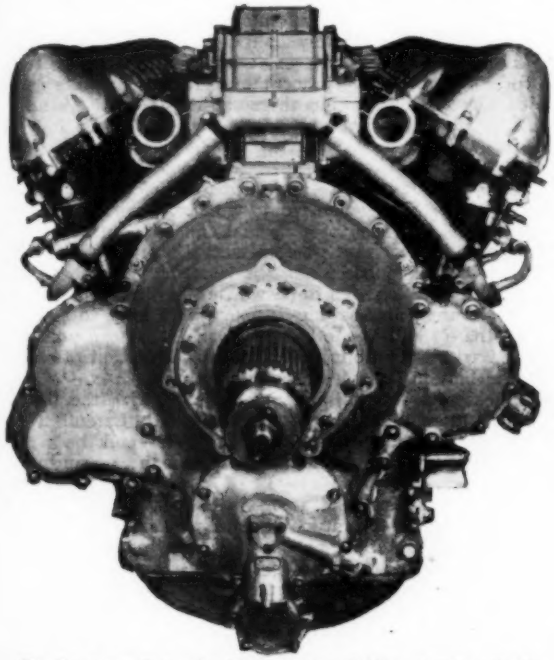
Cockpit layout is good and, although roomy, is not so spacious that the pilot feels like a pea in a saucepan. His field of view is also excellent. Immediately behind the pilot is the main fuel tank (well placed from c.g. consideration) and behind this is the observer's cockpit.

2,200 Horse Power

The Griffon II engine is installed in the aircraft as a complete power plant, and is isolated from the cockpit by the usual fireproof bulkhead. An unusual feature, however, is the passing of all engine and accessories' controls through a fireproof box so that isolation is complete. Immediately above the spinner on either side of the top cowling are air intakes which direct cooling air to the magnetos and generator. In the chin position are the coolant and oil-system radiators, housed in a cowling rather in the Typhoon and Tempest manner; whilst projecting forward from each wing root and snugly lying alongside the lower cowling are the carburettor air intakes. Hot air is also taken from exchangers in the coolant system via lagged ducts to both cockpits and the four cannon to provide cabin and gun heating respectively.



Fast and well armed, the Fairey Firefly is also highly manœuvrable.



For its 2,200 h.p. the Rolls-Royce Griffon engine of the Firefly has very small frontal area.

For stability in carrier operation the Firefly is provided with an undercarriage track as wide as space considerations would permit. Each undercarriage leg retracts inwards and rearwards, and is locked up by means of a latch on the breaker strut. This latch also serves to lock the landing gear securely in the down position, but is also assisted by a radius rod which governs the rearward retraction motion. The wheels are mounted on cantilever axles and are prevented from twisting under landing drag by splining between the upper and lower oleo leg members.

All the various devices which are a necessary part of Fleet Air Arm aircraft, for example, catapult spools, arrester hook, wing folding locking struts, etc., are housed in recesses so that in flying trim the external surface of the machine is hardly broken.

The fuselage is of conventional monocoque construction, except at the extreme tail, where a modified Warren-girder system of tubular bracing is used to combat the possible breakage consequent upon a heavy tail-first touch-down. Such landings are not uncommon when putting down on a carrier. The construction of the wings is conventional in the stressed-skin manner.

Control surfaces with the exception of the rudder, are all-metal (the rudder is fabric-covered), and it is interesting to learn that the ailerons, which are pressed-out in fairly heavy-gauge sheet, are all made so accurately that there is virtually no detectable difference in aileron response between different aircraft. A most unusual thing.

An article dealing with Fleet Air Arm aircraft, with special reference to the Firefly appears on pages 500-502.

This is Test Flying

Half an Hour of a Production Test Pilot's Life : The Routine of Checking : A Reply to the Romantics

By "ONE OF THE MANY"

TO the average person—even one closely connected with the aircraft industry—the words "test pilot" produce in the mind a series of strangely diverse, and generally quite incorrect, pictures. He remembers, perhaps, a remarkably good ground-level aerobatic show with a prototype at a flying display in peacetime; or, if he was lucky enough to have been invited, a "first" flight of a new type by the somewhat publicised chief test pilot of a big firm; or even, during this war, the sight of an entire test team sitting round a stove and making aviation small-talk while waiting for the appearance of the next series of aircraft off the production line.

It all seems very easy-going and faintly romantic, as well as being a rather simple life with short "working" hours and a good deal of play. Even the better-informed person, who knows that the polished display was preceded by hours of practice, that the "first" flight was only the termination of hours of "straights" and concentrated cockpit practice, and that a test team cannot fly all day—even this person may not be able to visualise quite what it all means and may still, at the back of his mind, have the idea that a test pilot's day consists of an hour or two's amusing flying interspersed with periods of feet-up ease.

At the risk of embarrassing those whose job it is to do this sort of thing all day and every day, and who expect neither commendation nor publicity, medals nor mention, here, in "thought diary" form, is a description of a typically bad half-hour in a production test-pilot's life.

"This is the last day of the production week—and the last aircraft out. The Met. people weren't too optimistic, but their 'front,' at its forecast worst, is still overdue, and I suppose we'd better put up a show. It's raining, the lower broken layer looks like 1,200ft., but the main layer is still somewhere in the early thousands. We'll have to go for glory or whatever. Wonder how high the 'top' is? Why *can't* they make water-tight aircraft? Still, I'm more comfortable (in body at least) than the fellows waiting to take away the chocks after I've gone through what they think is an unnecessarily lengthy cockpit check and run-up. Lengthy? I'm only checking half the things I'd like to.

Filling the Snag Sheet

"Everything seems to be under control. I'll wave the chocks away and the blokes can get under shelter. Take-off check—trimmers set; there's no such thing as 'mixture' nowadays: petrol correct; airscrew in override; flaps up—off we go. Bit on the tail-heavy side; must get the tabs screwed up a couple of turns. No 'up' lights; re-select—ah, here they come; undercart only needs a little exercising. Take-off boost high . . and combat boost a shade low. Tricky for the fitters. And *very* left-wing low. Can't climb through cloud like this; must land and get it fixed as far as possible. Why *must* the wind always blow from this awkward direction? I'll get the other jobs done later when I've got a full snag list.

"Off again. All the instruments seem to be functioning and the thing's now flying reasonably level. One circuit, set the gyro on zero, and we're on our way. As I thought broken layer at twelve hundred and raining pretty hard. Three thousand and we can still see the ground. Wumph—we're in cloud. Gyro zero; horizon level; top and bottom needles central; one-seventy on the clock. Hold it there and write down the temperature and pressure figures as well as those boost corrections—shan't have time later. These things climb so quickly that it is all one can do to catch the full-throttle height boost drop-off and the figures at alternate thousands. It's better when the rated boost *is* a little high—one can see the needle move just before the height figure has to be written down. Better check the revolutions and speed again before F.T.H. is due, or we'll get a false figure. It's dropping now—at a height just below normal, but well within tolerances.

"Still no top to the cloud. Probably we've passed unnoticed through several shallow layer-gaps. Better switch on the pitot-head heater and wind on a little more oxygen. That very little left-wing lowness is becoming something of a bore when flying with the left hand; we'll wind on just a little rudder bias to hold it up. Must make a note of that draught, and of the way that bit of top cowling kinks between the two buttons. The charge rate's low, too

On the Way Down

"We've finished with the boost figures. Now all we've got to wait for is the automatic blower-change. Hope they've fitted the right altitude switch for the type, otherwise heaven knows where we shall be before we start to come down. Any moment now—ah, there it goes, with the red light steady. A quick check of S-gear combat boost and we can start to come down. And we never reach the top of the cloud, though a suspicion of sun could just be seen.

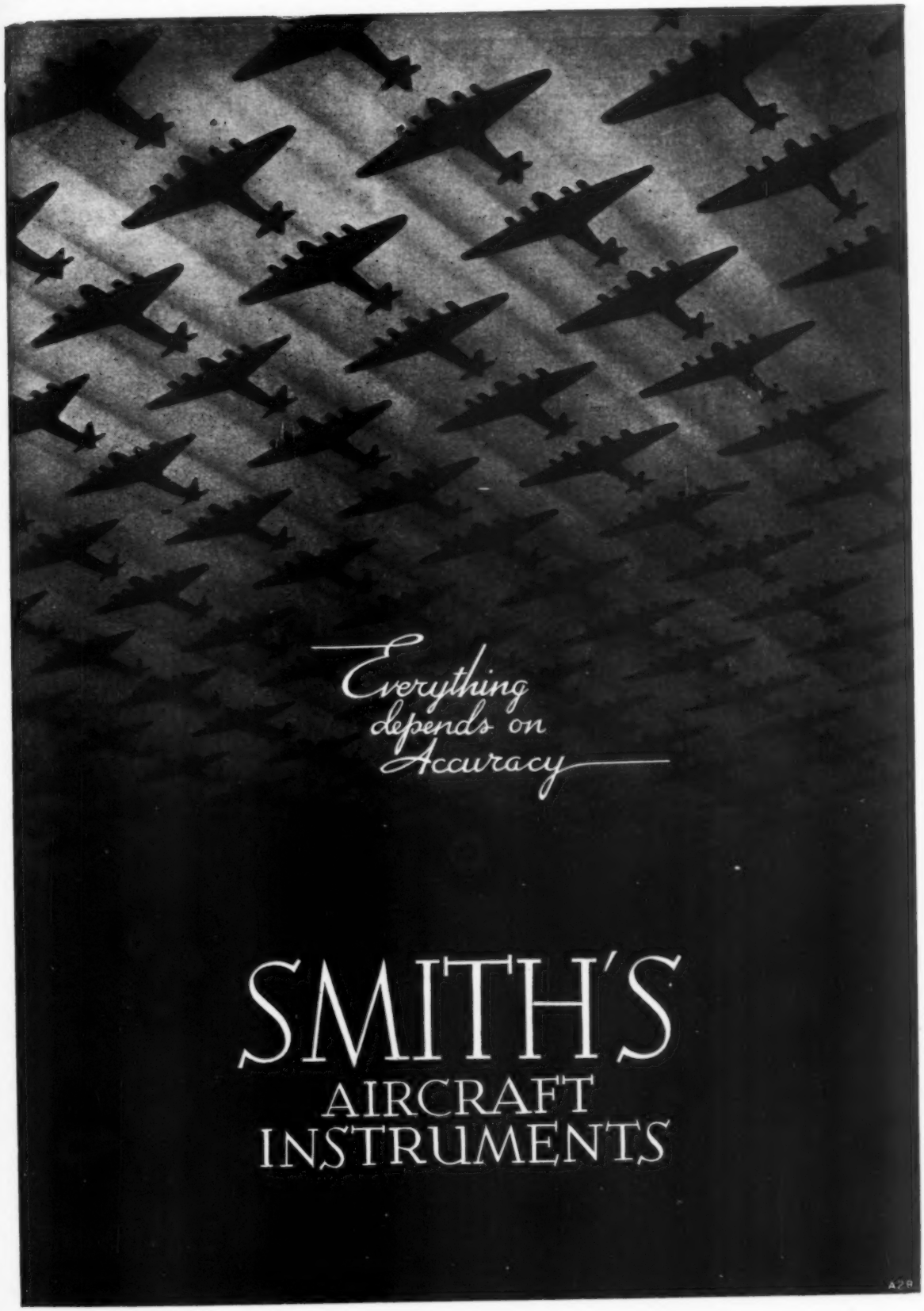
"The course was across a westerly wind, so the turn had better be made through west, to make some allowance for it—being *very* careful not to topple the gyro; it's a long way down and if we're not on a reasonably accurate reciprocal the first sight of land will be Timbuctoo or worse—one feels such an idiot landing at a strange airfield to ask where it is.

"Time to start preparing for the level-speed run at xy-thousand feet. With another thousand to go, open up to combat boost, with maximum revs, and lose height more and more gradually. Now hold it level and watch the A.S.I. needle settling back to datum speed. It takes two or three minutes of very accurate flying to be quite sure of it. Um . . . datum plus three or thereabouts. Throttle back to 'rated,' and make another turn back to a gyro zero before diving.

"I *hate* diving in cloud, but there should be lots of room to pull out in daylight below the main cloud-layer if anything goes wrong. Down we go with ear-drums cracking. Aileron upfloat seems to be normal and it doesn't seem to be as left-wing low as it was. In fact, it's very slightly the other way. Aileron skim must be 'panting,' but the trim-change isn't bad enough to be worth attention. No appreciable vibration at the wing-tips, but we'll have to fix this hood—there's half a gale blowing inside. We can pull out now. Darkness in front; I thought so—we're out of cloud and the bottom layer is still a broken one.

"Luckily there's nothing much wrong with the thing, and one more flight should do the trick. Lateral trim, boosts, elevator tabs, draught, charge-rate—and the maximum revs are just a shade on the high side . . . and that cowling. . . ."

But that, you'll say, is "stooge" testing; what about real experimental and prototype flying? In some ways it is less interesting. So much of it is just a long series of figure-obtainments, repeated *ad nauseam* so that the technicians can garner their information. Level speeds, level cooling figures, "partials" to ascertain the best climbing speeds, stick-force readings, handling characteristics at high Mach numbers . . . and so on. Just very hard, sometimes tedious, often frightening, sometimes interesting, and occasionally very exciting work.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Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

MUCH ADO : This twin-engined fighter-bomber publicised lately by the Germans as the new "Superman's Super Plane," is merely a rehash of the familiar Me 210.

Rusty Doodle-bug

A SWEDISH patrol boat has found what is believed to be the remains of a German robot bomb in international waters. The object, which is very rusty, is being examined.

Attempt on Airfield

SVENSKA DAGBLADET reports that Norwegian patriots have carried out a *coup* against the former drilling ground at Gardermoen: A car with the *Reichskommissariat's* markings arrived at the airfield with four "high officers" who wanted to inspect the airfield. The guard officer, however, demanded further proof, upon which the "officers" seized their revolvers, shot two of the German officers in the guard quarters and disappeared in the car.

Non-stop Air Service to Japan?

ACCORDING to certain foreign observers a non-stop air service between Japan and Germany is now being prepared. These assumptions are based on reports of new German long-distance aircraft, the justified need for which cannot otherwise be explained in Germany's present situation. A six-engined Ju 390, presumably a development of the well-known Ju 90, is said to be the most important of the new types, others being the four-engined Me 243, 250, 264, He 234, 277, and the six-engined Fw 300. No mention is made of any particulars of these types.

Luftwaffe as Footsloggers

THE German command is closing down *Luftwaffe* training camps and sending prospective airmen to the front, said a Moscow radio report.

Corporal Herbert Schwartz, of the 1113 Regiment of the 551st German Infantry Division, recently captured by the Red Army, stated that several units of his division are formed by flying school trainees. Five hundred men in his regiment come from one German fighter pilot school.

A large number of flying schools have been closed down and prospective observers, radio operators and bomb aimers from training schools throughout Germany had been transferred to the infantry.

A German Patent

A GERMAN invention, possibly connected with the manufacture of robot bombs, was on exhibition in the Stockholm Patent Office library.

The invention is called a device for the automatic steering of a vessel, especially aircraft, along a curve entering a previously determined direction at a tangent. The designers are A. Protzen and P. E. Koester, of Siemens *Apparate und Maschinen Gesellschaft*, Berlin, and priority rights for Germany are desired from September 1st, 1939.

The application was submitted to the Patent Office through Siemens A/B in Stockholm and dated December 13th, 1943. A slight alteration in the text was made on April 15th, 1944.

One Nip per Trip

THE Japanese are using "Human V.1.s"—air torpedoes with a pilot—against the American fleet in the Philippines, according to Japanese military circles quoted by the German News Agency.

Dr. Lilly Abegg, German Overseas News Agency correspondent, described the new weapon as "a kind of V.1 with a pilot," and said that it had only enough petrol for the flight to the attack.

"There is no flight back," said the correspondent.

All pilots are very young and their training took about two or three years. They are organised in the "Kamikaze Corps" named after Kamikaze (the Divine Wind) which destroyed the enemy fleet in the period of the Mongolian invasion and saved Japan.

The tactics employed by the suicide pilots are to try to hit the side of the ship.

The German correspondent cheerfully adds that "hundreds of living bombs are waiting for the hour of their victorious death."

Incidentally a Japanese communiqué quoted by Tokyo claimed that Japanese suicide pilots of the "Divine Wind Squadron" have sunk or damaged 19 Allied warships in the water east of the Philippines in one week.

Discretion

MILITARY circles in the Reich capital explain the fact that the attack on Southern England and the area of Greater London with "V-1" weapon is no longer continuously mentioned in the official German communiqué, by saying that the longe-range missiles have recently, for obvious reasons, no longer been sent over in the same quantities as in the preceding weeks.

The question whether the "V-1" has been recently improved was left discreetly open.

Night Vision

BERLIN reports deal explicitly with "Noctan B," which is said to be a remarkable German medical preparation enabling people to see at night. It is being used by German night fighters and authoritative quarters declare that the good results of night fighters depend just as much on Noctan B as on the new location instruments. Noctan B triples the distance at which the enemy can first be spotted. Noctan B's predecessor called Noctan A was discovered one year ago by Professor Brömser, of the physiological department of the Medical Faculty of Munich University.

Gen. Student

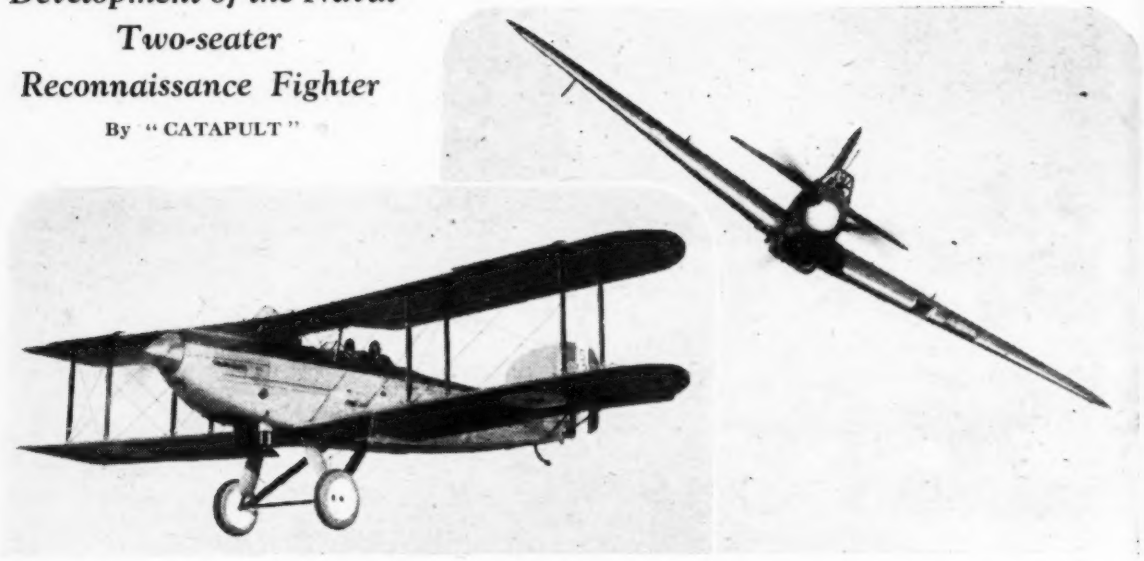
AMONG the three German Generals who have recently taken over the armies in the West is a *Luftwaffe* officer who once attended the Hendon Air Pageant and has now taken over the 1st Paratroop Army. He is Col. Gen. Kurt Student, born in 1890, a Squadron Leader of a fighter group in the last war and later a pilot-glider instructor.

Student was the organiser of the *Luftwaffe* paratroop formations and was promoted to the rank of full General and decorated with the Knight's Insignia to the Iron Cross during the initial phase of this war. He saw service in the Balkan and in Crete. He belongs to the "younger set" of generals and is regarded in Nazi circles as entirely reliable. He was recently credited with the organisation which led to the salvage of the Duce from Gran Sasso.

Fleet Air Arm Equipment

Development of the Naval Two-seater Reconnaissance Fighter

By "CATAPULT"



In the Fairey IIIF (left) a crew of three was carried, pilot, observer, and radio operator. The Fulmar (right) marked a notable advance in Fleet Air Arm equipment, both as to performance and fire power.

THE development of the two-seater naval air-arm reconnaissance fighter has been persistent ever since there was a division in tactical ideas some 15 years ago. The confined nature of aircraft carriers, coupled with the very limited number of carriers available for a navy whose duty extended throughout the oceans of the world, gave ample scope for the British tendency to compromise.

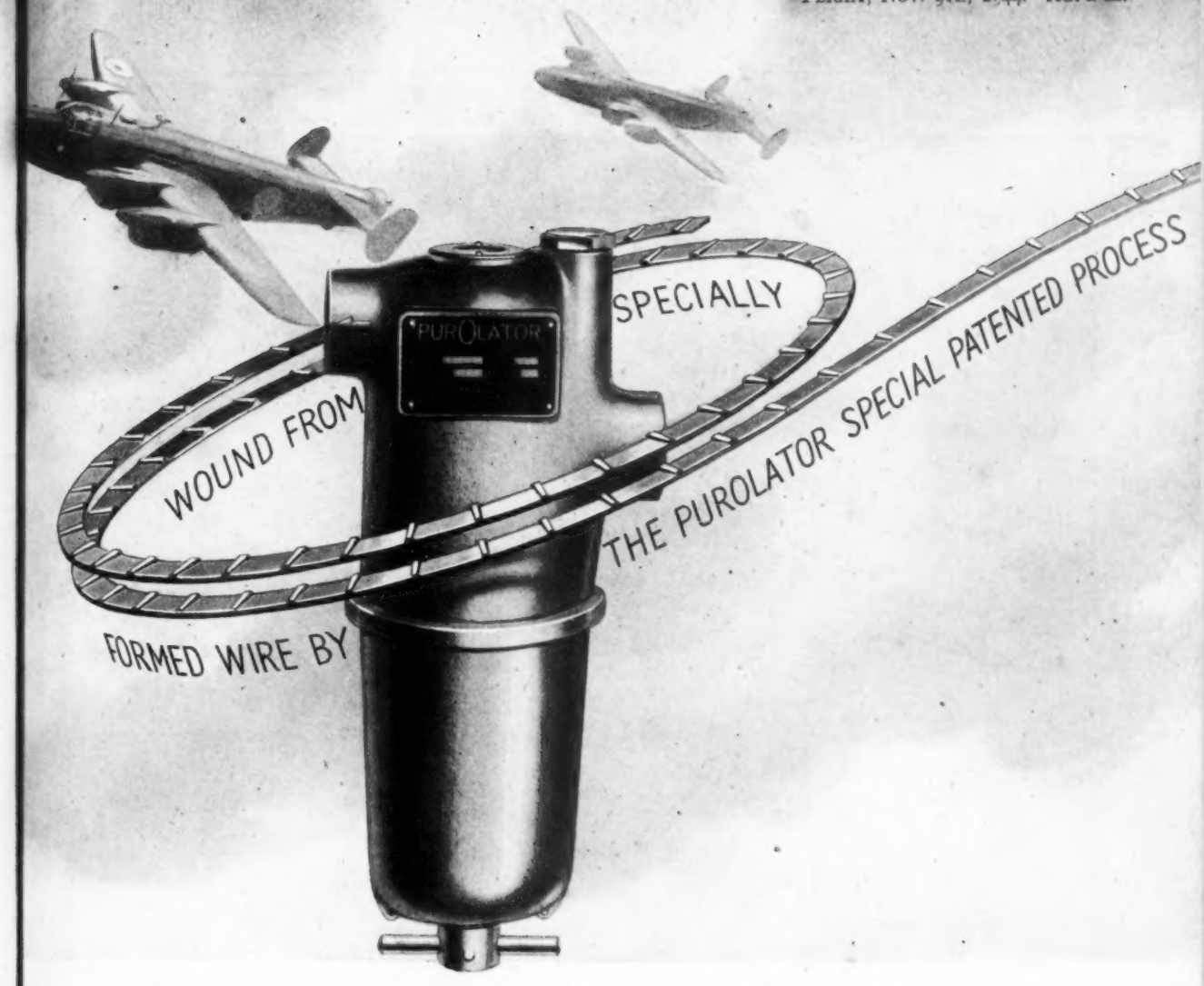
THE peculiar conditions in which aircraft of the Fleet Air Arm have to work are not always appreciated by those who have not made a special study of the subject. In this article our contributor explains the reasons for the changes that have been made from time to time, and points out how evolution has led logically to the latest type of naval two-seater reconnaissance fighter, the Fairey Firefly, shown in the following pages.

This can be seen in a brief comparison. The Beaufighter is available as a torpedo-bomber, a rocket-projectile and cannon-gun fighter, and as a night fighter—but it is never all of these rolled into one. Against this the lack of hangar space in the aircraft carriers made it impossible to accommodate all the types of special-duty aircraft thought to be needed at sea, and a major result of this was that multi-purpose types were developed on the general plan of putting as many eggs as possible in one basket.

This basic assumption caused certain types to vanish. The single-seater torpedo bomber, as represented in the Blackburn Dart, disappeared. The fleet-spotter type (*vide* Avro Bison) became widened in scope to include reconnaissance work, its slowness being deemed an advantage since it could remain longer in contact over a given point of vantage. The torpedo aircraft enlarged its duty to become torpedo - spotter - reconnaissance with the introduction of the Blackburn Ripon and then the Baffin. Thus, in one aircraft, equipment had to be available—though not necessarily all at once—for torpedo attack, air defence, bombing, reconnaissance reports, fleet gunnery spotting, and many other activities, including smoke-screen laying. As though this were not enough, the aircraft were required to have folding wings, flotation gear, and those rugged characteristics which would enable them to survive the rough handling of horny-handed deck parties.

A major advance in reconnaissance aircraft came with the Fairey IIIF, a biplane fast for its day and duties, with a crew of three. The pilot was virtually no more than the driver. The observer was always a naval officer (complete with Bigsworth board and all manner of impedimenta). The radio operator, termed Telegraphist-Air Gunner, worked the radio box of tricks and manned a manually operated rear gun. The pilot was a specialist in

The Blackburn Shark was typical of the torpedo - spotter - reconnaissance class, known for short as T.S.R.



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The metal elements of Purolator filters provide a consistent degree of filtration by virtue of the precision method of manufacturing the element wire.

They have further advantages by presenting a smooth cylindrical exterior which is easy to clean, and by their great mechanical strength, which enables them to be used for pressures up to 5,000 lbs. per sq. in.

Their construction is highly efficient, non-choking and gives perfect edge filtration. Purolator filters can be made in Monel metal, stainless steel or bronze, as may be required.

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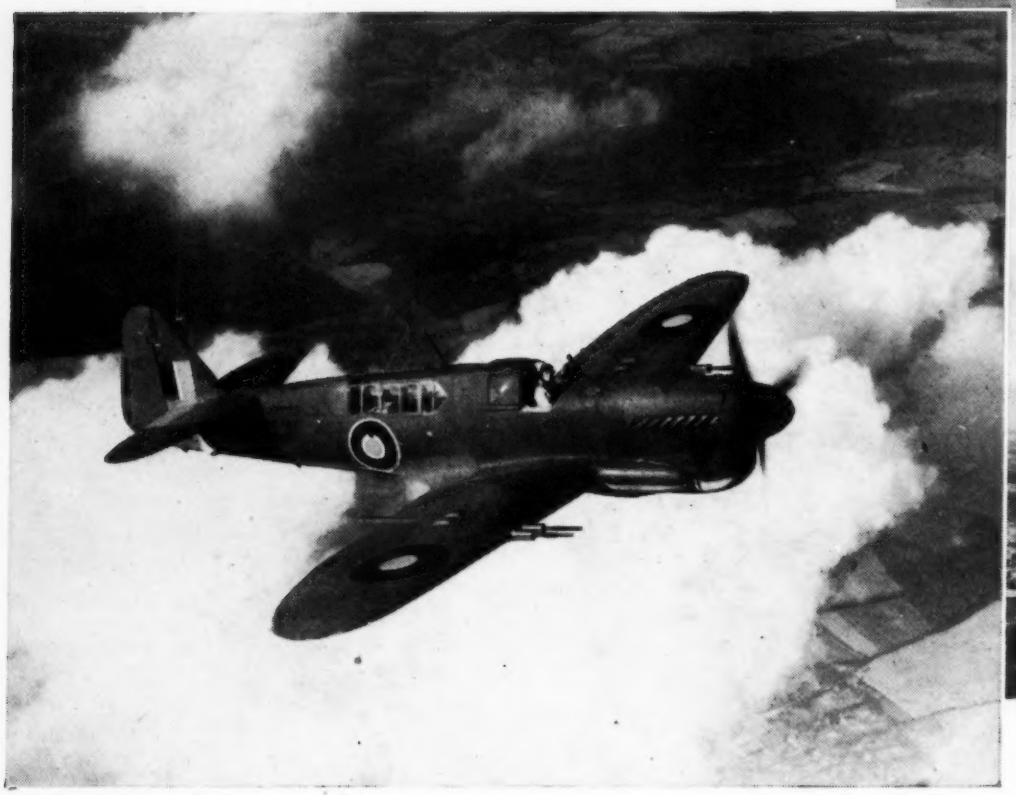
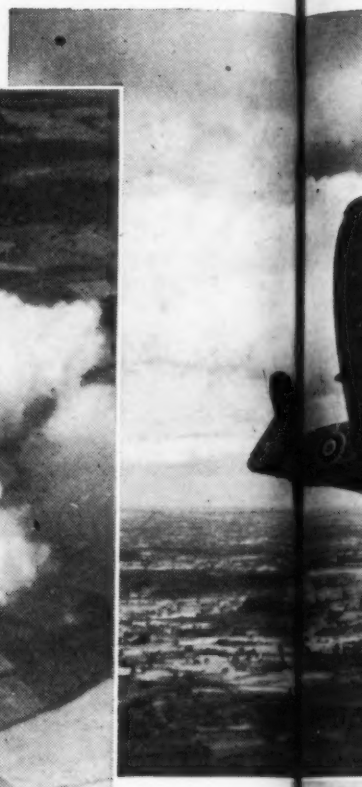
FLEET AIR ARM E

The Fairey Firefly, in Addition to Being Powerfully Armed, Has a High Performance.





LATEST AND FASTEST: These views of the Fairey Firefly in various attitudes show well the chief characteristics of this new Fleet Air Arm two-seater reconnaissance-fighter. Powered by the Rolls-Royce Griffon engine, the machine has the usual provision for catapult launching and deck arrester gear. The view from the pilot's cockpit is so arranged that he can clearly see the batsman when landing-on.

that he was trained for deck flying, and in those not-so-far-off days there were no arrester gear wires to assist landing-on.

The job of the observer was to be The Brain. His was the responsibility of navigation and for the complicated systems of search and sweep over wide areas of open sea. He had not only accurately to cover assigned areas of patrol but the more personally important duty of directing the pilot back to the parent ship after, say, four hours' flying in which the ship could easily have moved 80 miles from its starting position. This duty carried with it the knowledge that in time of war the ship would maintain radio silence in order not to disclose its position at sea for the benefit of the enemy.

Backbone of the Fleet

These affairs nowadays seem much involved. Special equipment has altered many of the almost insoluble problems of yesterday, and the tremendous striking power of carrier-borne aircraft has raised the status of the carrier to the position of being the backbone of the Fleet.

But in those days, when ideas were being worked out, the true value of the carrier was, to use a term from Scottish jurisdiction, "Not Proven." Such a view is still retained in diehard quarters where it is believed that a Fleet engagement must be between battleships, cruisers and destroyers. The brilliant night action at Taranto (1940), the decisive battles in the Coral Sea and off Midway Island (1942), as well as the present great American victory in the Pacific, do not affect the contention of those who assert that air power at sea is subject to favourable meteorological conditions by day and by night, and this factor is not nearly so operative with warships as can be seen in the textbook action against the *Scharnhorst*. However, the irrefutable successes that can be directly attributed to carrier aircraft are more than swaying even the most conservative British opinion, whilst the U.S. Navy makes no bones whatever about its belief in air power at sea. The great victories of the Coral Sea and Midway were won without the warships exchanging a single shot.

The value to surface ships of air reconnaissance information—so patent in theory—was unhappily marred in pre-war days by the inability of aircrews to identify opposing ships in test exercises as definitely as reconnaissance reports rendered by submarines and destroyers. When an air report gave a sighting of a cruiser, for example, cautious captains did not overlook the possibility of that ship being a destroyer, and were often justified in their pessimism.

Nevertheless, the staff theory of the air reconnaissance potential was adhered to. Large warships without flying decks were required to carry seaplanes. The Fairey IIIF, for example, and its part-recco successor the Swordfish, had floatplane versions, whilst the Supermarine Walrus and Fairey Seafox represented other interpretations of staff ideas. These may be considered as sidelines

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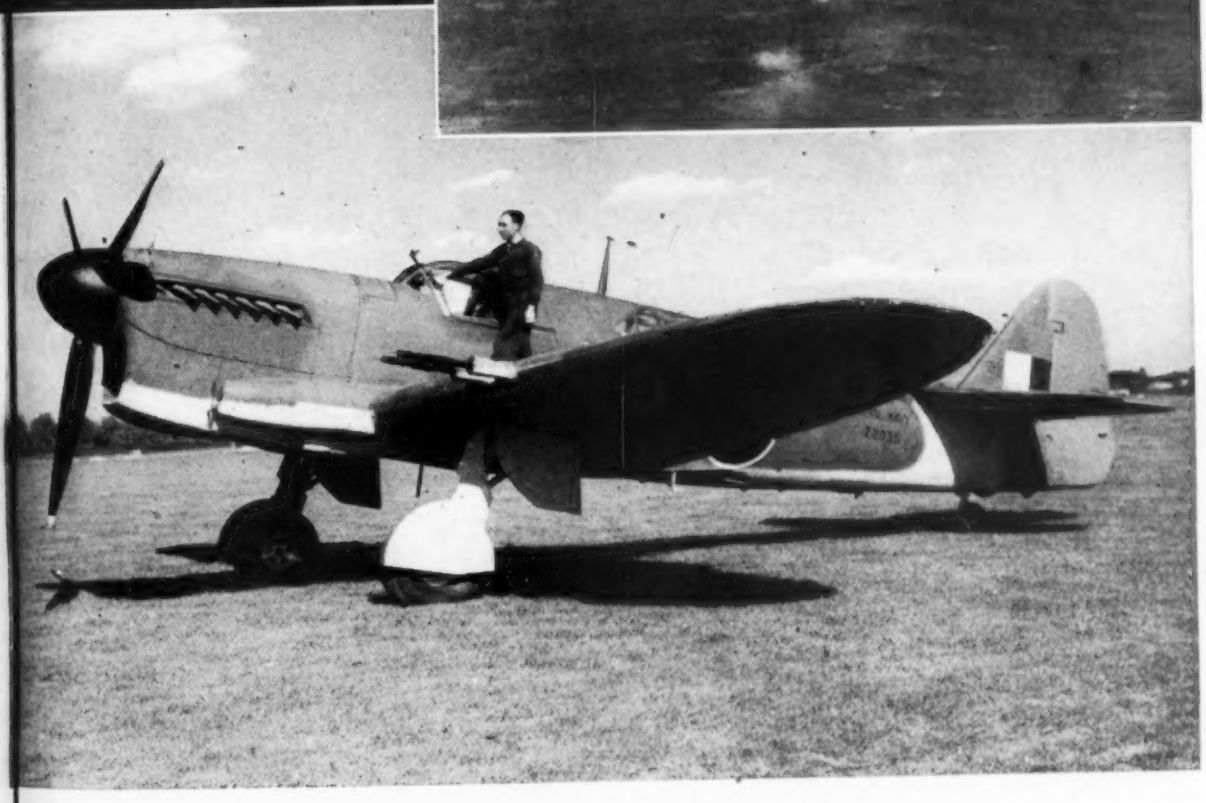

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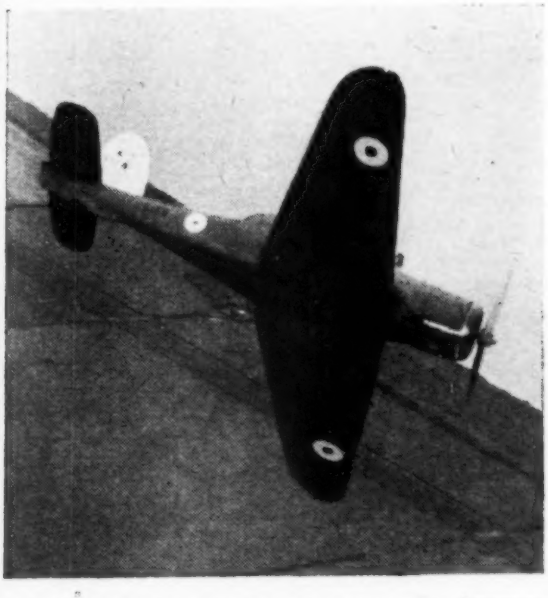
FLEET AIR ARM EQUIPMENT

to the basic idea of reconnaissance from carriers.

It was considered necessary for the recco-duty aircraft to have the means (either in extra speed or defence) to disengage from opposing aircraft. Their primary duty was to send back accurate sighting reports to the surface ships. In pursuit of this policy a variant of the famous Hawker Hart was produced under the name of Hawker Osprey. The Osprey effected two improvements: it gave the recco aircraft an advance of at least 40 m.p.h. in speed, and economised in personnel by carrying only a pilot and observer instead of a crew of three.

The Osprey was a satisfactory aircraft for its time; but many moons were to pass before it was given a modern replacement. It must be remembered that up to the outbreak of war, and including such ships as the *Pegasus*, the Royal Navy had fewer than 10 aircraft carriers all told, and of these only the *Ark Royal* was a modern ship.

The Hawker Osprey carried a crew of two only, and had some 40 m.p.h. in speed over previous reconnaissance types.



To the Blackburn Skua fell the honour of shooting down the first German aircraft in this war (September 26th, 1939).

In order to simplify duty and yet retain so far as practicable all specialised characteristics, the operational squadrons of the Fleet Air Arm were broadly divided into torpedo craft or fighters. The Fairey Swordfish and Blackburn Shark emerge by 1936 as T.S.R. types, for torpedo-spotter-reconnaissance duty, but their chief work was as a torpedo-bomber striking force. In the fighter class we see the famous Gloster Gladiator (last of the biplane fighters in the R.A.F.) adapted to naval deck-flying requirements under the name of Sea Gladiator.

There was, however, one diversion from the conception of two-type naval air arm, and that was the Blackburn Skua and its variant the Roc. The Skua rated as a naval fighter-dive bomber. In fact, the Skua shot down the first German aircraft at sea in this war (September 26th, 1939) and also sank with bombs the first warship to be sunk by air attack in this war, a K-class cruiser believed to be the *Köln* or *Königsberg*. The Roc embodied a power-operated rear gun turret of the type used in the Boulton-Paul Defiant, but has not achieved the distinction of battle honours such as attained by the Defiant. The Skua was a passing phase and was not built in great quantity.

Introducing the Fulmar

The significant point is that no direct successor to the Osprey two-seater reconnaissance-fighter was introduced for a long time. In the R.A.F. this type of aircraft was represented, and just before the war numerous squadrons were equipped with the Fairey Battle day and night bomber-fighter-reconnaissance monoplane. Scandinavian countries had a two-seater naval recce. aircraft in the Fairey P4/34, for the most part a variant of the Battle. When naval ideas resumed demands for a successor to the Osprey, these were met by the Fairey Fulmar, a direct derivative of the Battle and the P4/34.

Introduction of the Fulmar, equipped with Rolls-Royce Merlin engine, was a notable advance in Fleet Air Arm

"The excellent engineering feat of cutting the wings of the Spitfire to make the complicated double-fold of the Seafire III seems all the more intricate on viewing the Firefly's wing-folding arrangement."

FLEET AIR ARM EQUIPMENT

equipment. It had a comfortable cruising speed of 175-185 m.p.h. and a top speed of more than 250 m.p.h. But its most important aspect was that it mounted eight machine-gun calibre front guns. It thus surpassed the attack power of the Sea Gladiator, its speed and armament, and though by this time the Sea Hurricane had emerged (also with eight guns) neither of those aircraft carried the essential navigator for reconnaissance-plus-fighter duty. It is worth while recalling, in brief, the very valuable night reconnaissance work which the Fulmar effected in the pursuit and destruction of the *Bismarck*.

The veil of secrecy concerning naval aircraft has been extensive. I am subject to correction, but though I do not think any standard reference book has yet given the performance details of even the Fairey III, the Fulmar must claim the prize for hush-hush. It holds the extraordinary record of having come into this war on the secert list, of disappearing from front-line operational squadrons, and of passing out of production without any details of it having been released other than a few photographs.

Nevertheless, the Fulmar's reconnaissance work has been of great value in this war, and has led directly to the development of the present Firefly. Fulmar squadrons formed the fighter defence of *Illustrious* and *Formidable* during the critical days of 1941, when things were shaping badly in the Eastern Mediterranean and Western Desert.

Vital Role of Recce.

On January 10th, 1941, *Illustrious*, in company with major warships, was in escort to a large convoy for Greece. Mussolini had sworn to "get" *Illustrious* in revenge for Taranto, and in the narrow waters between Africa and Malta the ship was attacked for seven hours. Her Captain then was the present Fifth Sea Lord, Vice-Admiral Boyd. Against the successive waves of bombers, dive-bombers and torpedo bombers, *Illustrious* could send up no more than a handful of Fulmars.

A simflar story concerns the *Formidable*, attacked a few months later after a raid on Scarpanto. The Fulmars performed miracles of defence but they were numerically far inferior to the Ju 88s, so that this ship, too, was badly damaged for lack of fighter protection.

The salient point about both these actions was that first the enemy had to sight and pin-point the positions of the ships to be attacked. Until that had been effected the attacking bombers could not be despatched. It is clear, therefore, that provided a fleet can shoot down the enemy's reconnaissance aircraft it has every possibility of remaining immune to air attack.

It is the fact that scores of Italian and German reconnaissance aircraft were intercepted and shot down in the Mediterranean before they could make their sighting reports, and in this work the Sea Gladiator and Fulmar figured prominently in the early days of the war. It was galling not to be able to proclaim these victories, which were in result out of all proportion to the mere destruction of one enemy aircraft. What might have happened—what the enemy chiefs-of-staff might have been justified in thinking would happen—is best exemplified by the work which the Japanese reconnaissance aircraft effected concerning the sinking of the *Prince of Wales* and *Repulse* off Singapore. Had that roaming recce. aircraft been tackled before it made its report, the story of two fine warships would have been different.

Need for Navigator

The *raison d'être* of the two-seater reconnaissance fighter can now be seen in sharper perspective. The aircraft has to be despatched from a ship which will remain silent on the radio air. The recce. aircraft may have to travel anything up to 200 miles or more from the parent ship, seek out a searching enemy aircraft, destroy him in air combat, and then return to the ship without giving the enemy any true clue to the whereabouts of the floating base. This is the sort of basic duty that the new Firefly must fulfil, for no single-seater pilot flying over featureless sea could be expected to tackle the complex navigational problems involved, by night as well as day. The need for a navigator is clearly apparent.

How much air reconnaissance at sea can mean may be demonstrated by quoting some vivid words of Mr. Winston Churchill. We can guess that the Firefly may have to go to the Far East, and the vast expanses there are described by Mr. Churchill in the following terms: "The map of the world in the Admiralty War Room measured nearly 20ft. by 30ft. Being a seaman's map, its centre was filled by the greatest maps of water on the globe; the enermous areas of the Pacific filling upwards of 300 sq. ft. On this map the head of an ordinary veil-pin represented the full view to be obtained from the masts of a ship on a clear day. There was certainly plenty of room for ships to miss one another."

It may well be the function, then, of the Firefly to see that the chance of the right ships meeting at sea in the Far East, and of the carrier-borne squadrons being directed to the right targets, is stepped-up; for, excepting the fastest of land-based fighters, it seems it will be able to take on and win a combat with any counter aircraft the enemy may have in the air as a screen to his ships.

A.R.B. NOTICES

THE Council of the Air Registration Board has announced the publication of Notices to Licensed Aircraft Engineers and to Owners of Civil Aircraft, Nos. 3 and 4. These deal with the duties of aircraft engineers licensed in categories "A" and "C," and airscrews approved for use on civil aircraft respectively.

Four notices have now been published by the board in a comparatively short period in order to cover matters dealt with in notices previously issued by the Air Ministry and since cancelled.

PHOTOGRAPHIC LAYOUT REPRODUCTION

LAST week Handley Page, Ltd., invited representatives of the Press to a demonstration of the photographic method of layout reproduction which the firm installed some time ago, and which has now been working long enough for its efficacy to be assessed.

Very briefly explained, the system comprises the drawing, with a silver solder point on cellulose-lacquer-coated half-hard aluminium layout blanks, of the master layout; the photographing of the layout on a quarter-size glass plate negative; and the projection of the photographic image, on reduced, actual or enlarged scale, on to sensitised sheets which are developed and dried much as is an ordinary photographic print, and then sent to the shops. The original layout sheet and its glass negative are retained in store, so that any number of subsequent reproductions can be produced accurately in a very short time.

DEATH OF BRIAN ALLEN

THE British aviation community learnt with sincere regret of the death, through enemy action, of Brian Allen and his wife, Kathleen, in October last. Cremation was at Woking last Thursday, November 2nd, and at the request of the sons, Flt. Lt. Michael Allen and F/O. Rodney Allen, both serving in the R.A.F., remembrances took the form of donations to the R.A.F. Benevolent Fund.

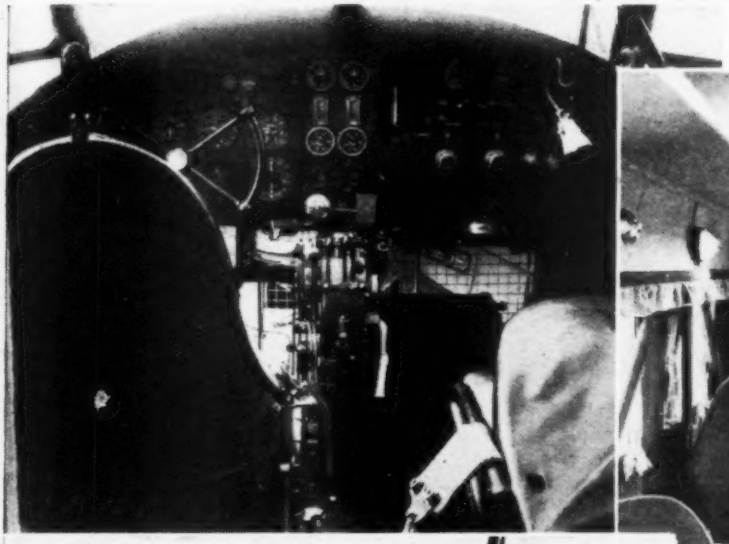
Brian Seamer Allen was born in London on May 1st, 1899. After making a name in the motor world, he entered civil aviation as manager and pilot of the aviation department of Henly's, having previously served in the first world war. Later he formed his own company, Brian Allen Aviation, Ltd., and became a well-known figure at Croydon and Heston. In addition to taxi work, the firm acted as agents and distributors of various civil aircraft types, including the diminutive Tipsy models, one of which Brian Allen demonstrated very effectively at one of the Royal Aeronautical Society's garden parties at Fairey's airfield.

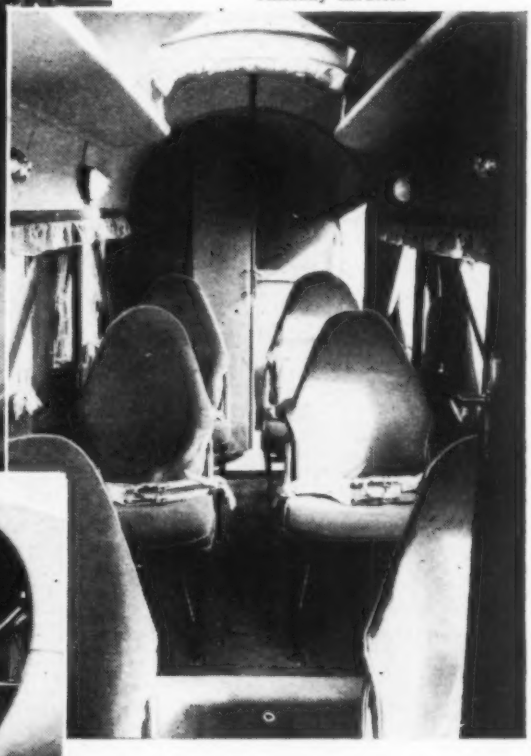
Private flying will be a great deal poorer after the war without Brian.

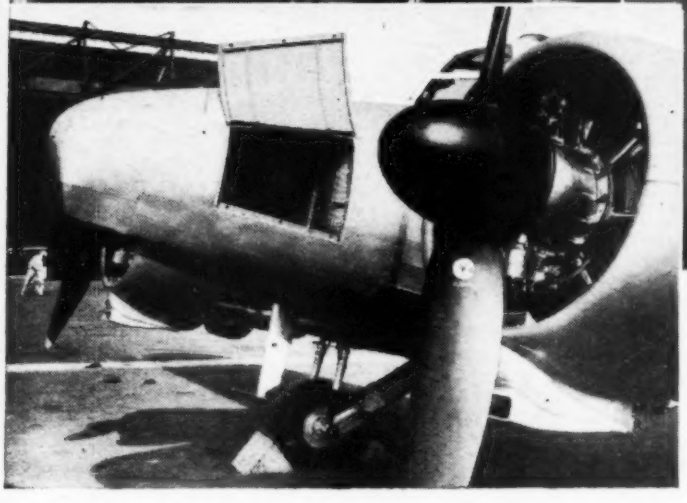
Civil Anson

For Feeder Lines and Air Taxi Services

(Above) Although designed before the war, the lines of the Avro Anson are still basically modern.







(Upper left) A glimpse into the "office," showing the compact and convenient arrangement of controls and instrument panel. (Above) Plenty of leg-room and good lighting are evident in this picture of the interior of the six-passenger cabin. With racks for light hand luggage and a toilet aft, "pullman" comfort is obtained. (Left) A sizable hatch gives quick access to a compartment in the nose for baggage, light freight or mail.

MORE than one type of military aircraft is likely to be converted for civilian transport in the immediate post-war era, but few will lend themselves more readily to the transformation than the famous Avro Anson, as this selection of photographs clearly illustrates.

Designed to meet the needs of feeder lines and air taxi services, this civil version of the Anson, recently introduced by A. V. Roe, Ltd., recalls the fact that a year or two before the outbreak of war there was a commercial version of the Anson, known as the Avro 652, which, as in the present case, was virtually the same aircraft as the Service Anson except for its interior economy.

That the civil Anson (1944 model) will prove itself eminently suitable for its intended duties goes without saying, for the worthiness of the type has been proved over and over again, and it has earned the enviable reputation of being one of the safest aircraft ever to leave the ground. Since war began it has successfully done all manner of jobs, from that of reconnaissance-bomber with what were then known as "Coastal Area" squadrons of the R.A.F., to that of ferry pilots' taxi with A.T.A. Nice to handle and utterly reliable, the Anson in any form has always been a favourite with pilots—it is one of those aircraft of which one hears it said, "It flies itself."

Powered by a pair of Cheetah XV engines with Rotol two-bladed c.s. airscrews, the new civil Anson has a hydraulically operated undercarriage and carries a crew of two and six passengers, considerable attention having been paid to comfort and stowage for a reasonable amount of luggage.

With a gross weight reported to be 9,500 lb. and its two Cheetahs, each supplying 375 h.p., power-loading is approximately 12.6 lb./h.p. With this goes a cruising speed of 150 m.p.h. and a still-air range of some 400 miles on a tankage of 140 gals. of fuel, giving a consumption of 2.85 m.p.g., or 52.5 gals./hr.

Civil Aviation

Royal Aeronautical Society's All-day Debate

THE Council of the Royal Aeronautical Society is to be congratulated on its decision to organise an all-day debate on the subject of civil aviation. The meeting, which was held in the lecture hall of the Institution of Mechanical Engineers, Storey's Gate, London, last Saturday, was so well attended that many could not find seats. Lord Brabazon, a past-president of the Society, took the chair throughout, and as Sir Roy Fedden said, it must have been a severe sacrifice on his part to do without the cigarette in its familiar long holder for so many hours (smoking is not permitted in the hall).

There were no lectures in the ordinary sense, but five speakers made opening remarks on different subjects, which were then followed by discussions. In his introduction Lord Brabazon reminded the audience that the power of speech was granted us for the purpose of communicating thoughts, not merely to make a noise, and as there was much to discuss in a short time it was necessary for all speakers to be brief, an admonition taken to heart by nearly everybody. The five speakers and their subjects were: Brig. Gen. Critchley, Director-General of British Overseas Airways Corporation (The Selection and Training of Personnel for Civil Aviation); Maj. R. H. Thornton, of the Alfred Holt and Co. shipping line (Economics of Air Transport); Mr. Roy Chadwick, chief designer, A. V. Roe and Co., Ltd. (Civil Aircraft Design); Mr. E. W. Hives, Rolls-Royce, Ltd. (Civil Aircraft Engine Design); and Mr. W. P Hildred, Director-General of Civil Aviation (Route Facilities).

GEN. CRITCHLEY said B.O.A.C. worked on a basis of three aircrews for each aircraft, the most that could be expected from the crews being 1,000 hours a year, and from each aircraft 3,000 hours. He stressed the time taken to convert combat aircrews into civil aircrews, about one year. At first aircrews would be taken in from the R.A.F. and given conversion courses, but he thought engineers would have to have civil training. He pleaded for the revival in the R.A.F of Short-Service commissions. Men would then do five years in the R A F and another five in commercial flying.

The training of station managers was a difficulty. They had to be able, in addition to their ordinary work, to entertain kings, ambassadors and people of every condition. In short, they had to be all things to all people. Administrative branches would have to be recruited from the educational establishments, and he had hopes that B.O.A.C. would be allowed to take over, after the war, one of the R.A.F. establishments and use it for training all branches of their own personnel. Service would be the keynote and aim of the training Discipline was essential, and a very large proportion of what was called "pilot error" came from disobedience of some order.

[Gen. Critchley made certain remarks on which we do not wish to waste space here, but which appeared to indicate that he ought to enrol himself as the first pupil at the "finishing school" in diplomacy which B.O.A.C. proposes to set up.—ED.]

Civil Discipline

GRP. CAPT. WILLIAMSON confirmed the long conversion course needed, particularly for engineers, to train them in civil maintenance, and also agreed on the question of discipline. In the A.T.A. they started with civilians, and discipline was difficult to achieve. As soon as they put their crews into uniform there was a marked improvement

SIR ALAN COBHAM welcomed Gen. Critchley's reference to the training of station managers. He recalled his own experiences when he was making long-distance flights through Africa, India and Australia, and said that if he had been taught some diplomacy before he started it would have been invaluable to him.

MR. THEODORE INSTONE suggested that every ambassador and governor should have a civil air attaché on his staff, and regretted that Gen Critchley had made no mention in his plan for the future of the A.T.C., which should be a fine source of supply.

MR. GANDAR DOWER agreed with the importance of training and recalled that the Air Registration Board is now shouldering the responsibility for training aircraft engineers.

AIR CHIEF MARSHAL SIR A. LONGMORE thought Gen. Critchley had exaggerated the time taken to convert from military to civil work. It might apply to a fighter pilot, but not, he thought to aircrews of Bomber and Coastal Commands. He would like Gen. Critchley to tell them if the personnel to be trained at the proposed B.O.A.C. establishment would be free to go to other companies.

In reply to a question concerning the length of a pilot's useful life, Gen Critchley said at B.O.A.C. they were endeavouring to arrange for pilots to benefit from a high pension at 45. The general scheme was that from 20 to 35 pilots were expected to go anywhere. At 35 they were asked where they would like to settle down, and for ten years they were then put on routes traversing the selected district During these years they were given training in administrative work which they could undertake from 45 onwards.

MAJ. R. H. THORNTON, as usual, was exceedingly witty and cutting in dealing with the economics of air transport. He began with the premise that there is no such thing as economic air transport, and followed up by throwing out suggestions and asking questions under such different heads as subsidies, air mail, airports, ground formalities, all-weather punctuality, short-haul possibilities, and air freight.

Of subsidies, Maj. Thornton said the difficulty was to know where to leave off, once one had started to subsidise. It was ridiculous to say all routes needed subsidies. Some did not, but on those which did the basis should be such that operators were on a common competitive level. He hit out—smilingly, but hard—at the aircraft designers who kept on increasing wing loadings until miles of runways were needed at airports. In shipping, on the whole, the vessels were designed for the ports, not vice versa.

It had become the fashion, Maj. Thornton said, to think of air transport in terms of thousands of miles. There were other aspects. In America they had developed very useful air services of 150-200 miles. America had gone mad on air freight. There was nothing aircraft could steal from surface transport, but it *could* create new traffic. There were many things which everyone wanted daily and wanted fresh. Those aircraft could bring from much farther afield. He could visualise a sort of Continental mail order house which would deliver daily and in a few hours anything which any customer anywhere in Europe ordered.

Runway Lengths

MR. CAMPBELL-ORDE pointed out that whereas in the old days airports had to deal with short-range aircraft only, they now had to cater for aircraft flying 3,500 miles. That meant much more complication and consequently the need for the right men in the air and on the ground. He had had many discussions with designers at home and abroad and was told there was no great difficulty in designing for good take-off in 10,000ft. and no great improvement in performance to be gained by designing for very much longer runs.

DR. ROXBEE COX thought some subsidies might be justified. A line might not pay at once, but might pay well in five or ten years. He pleaded for some other measure of transport efficiency than ton-miles per gallon. Perhaps ton-miles per hour might suit. It was not necessarily economical to fly slowly, and with the advent of jet propulsion, speed could be achieved economically, perhaps 300-400 m.p.h. or even more. An effort should be made to assess the economic value of speed.

MR. PETER MASEFIELD pointed out that since the earlier days costs had come down and speed and range had gone up. It was not true that 100 per cent. load factors were desirable. Best economy resulted from load factors of 65-70 per cent. of capacity. With modern aircraft we were now down to some 4d. per revenue-passenger-mile, and further economies were to be expected.

SIR ROY FEDDEN, referring to training, said we had marvellous material in the lower ranks, but we needed leaders. All branches must have better education.

CAPT. PRITCHARD thought the time would come when we should bring mutton from Australia by air, and that it could be done by charging the customer a penny extra per pound.

To Capt. Pritchard Maj. Thornton retorted that the extra cost to the customer of airborne mutton would not be a penny, but several shillings per pound! To Campbell-Orde he replied that it was not the 10,000ft. runways alone that had to be considered, but the vast area of country around that had to be sterilised because of the flat climbing angle of heavily loaded aircraft.

MR. ROY CHADWICK said if one took as a basis a passenger airliner suitable for world use, there were several arrangements possible, such as the tailless, the tail-first, the tandem, and the orthodox. The tailless did not give enough space except in huge sizes. The tandem offered a certain amount of saving in structure weight in large sizes. But, on the whole, he thought the four-engined orthodox type was the most practical at present and for some time to come.

As for size, except for very long range there was no need for the very large machine, and a better system was to have smaller aircraft working at higher frequency There was pay-load advantage in shorter stages. As an example, if the range was 4,000 miles and the pay-load 7 per cent., then at 3,000 miles it rose to 12, at 2,000 miles to 18, and at 1,000 miles to 25 per cent. of the gross weight. He suggested 1,000-mile stages; speed over ground 250 m.p.h.; cruising speed 300 m.p.h.; maximum speed 400 m.p.h. Then one could fly from 8-12, 12.30-4.30 and 5-9, which was as much as anyone wanted, except those in a very great hurry, and could cover 3,000 miles in a day.

Air transport features Mr. Chadwick placed in the following order of importance: safety; regularity; comfort; operating cost; cruising speed; original cost He made the interesting observation that first cost was less important than many thought. In one year's flying, for instance, the cost of the fuel might well be the same as the first cost of the aircraft.

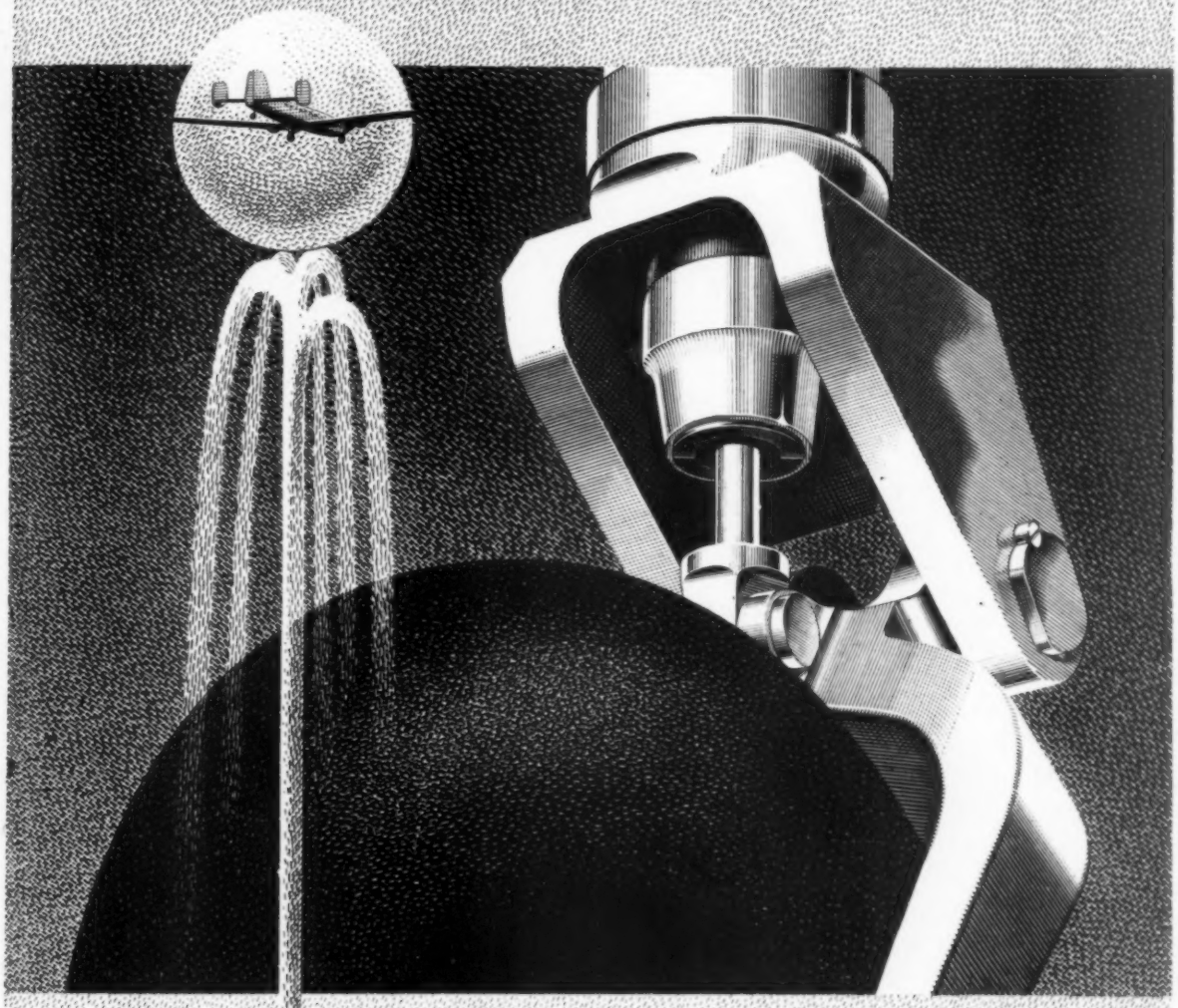
One important aspect was that of control. Should one carry a large crew to do all the work, or a small crew and rely on Radar? He personally wanted a competent crew, with good communications.

Space does not permit of a fuller report of the debate this week, but next week we shall deal with the introductory talks by Mr. Hives and Mr. Hildred, with the discussions which followed them and Mr. Chadwick's remarks, as well as with the more general discussion with which the debate concluded.

DOWTY

liquid spring

SHOCK ABSORBER



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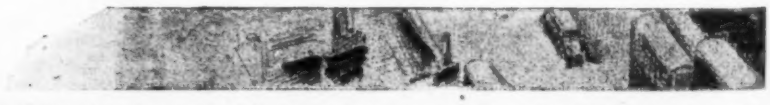
AN INTERESTING PARACHUTE EXHIBITION . . .

You are invited to visit an informative and interesting exhibition showing manufacture processes of parachutes. This exhibition, open until November 25th inclusive, is being held by courtesy of The Bristol Aeroplane Company Ltd., at their London Showroom, 69 Piccadilly, London, W.1.

AN EXHIBITION BY THE PARACHUTE MEMBERS OF THE S.B.A.C.

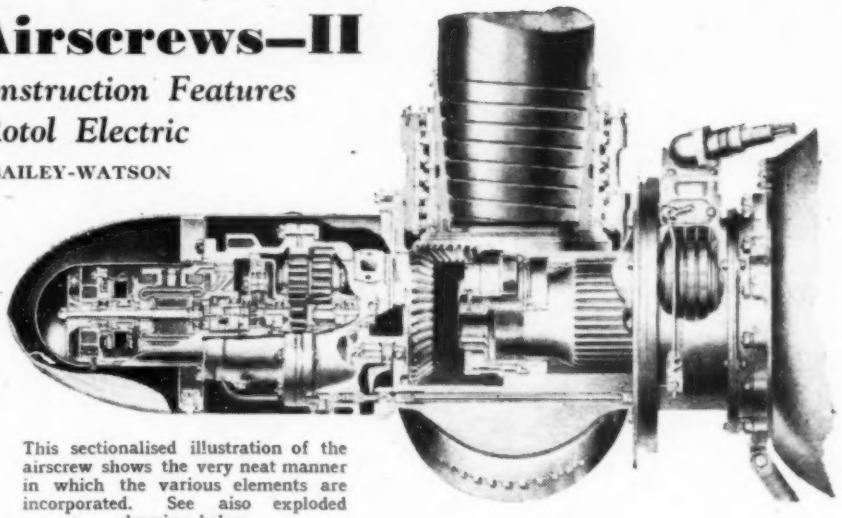


THE BRITISH PARACHUTE CO. LTD. ● THE IRVING AIR CHUTE OF GREAT BRITAIN LTD. ● THE "G.Q." PARACHUTE CO. LTD.

Modern Airscrews—II

Design and Construction Features of the Rotol Electric

By C. B. BAILEY-WATSON



This sectionalised illustration of the airscrew shows the very neat manner in which the various elements are incorporated. See aiso exploded drawing below.

THIS, the second article in the series on Modern Airscrews deals with the Rotol electric airscrew, which is a modified version of the American Curtiss Electric, but is made in this country.

The British product is a very neat job, Rotols having succeeded in making their epicyclic reduction gearing somewhat smaller than the American original, without any sacrifice of robustness. They have, in addition, decided to employ a higher power although smaller size electric motor, its power output being $\frac{1}{8}$ h.p. as against the 1/10th h.p. of the Curtiss.

In point of fact, pretty well every component of the Rotol airscrew is of different detail design than the corresponding item in the Curtiss, but the general layout and principle of the two airscrews is the same.

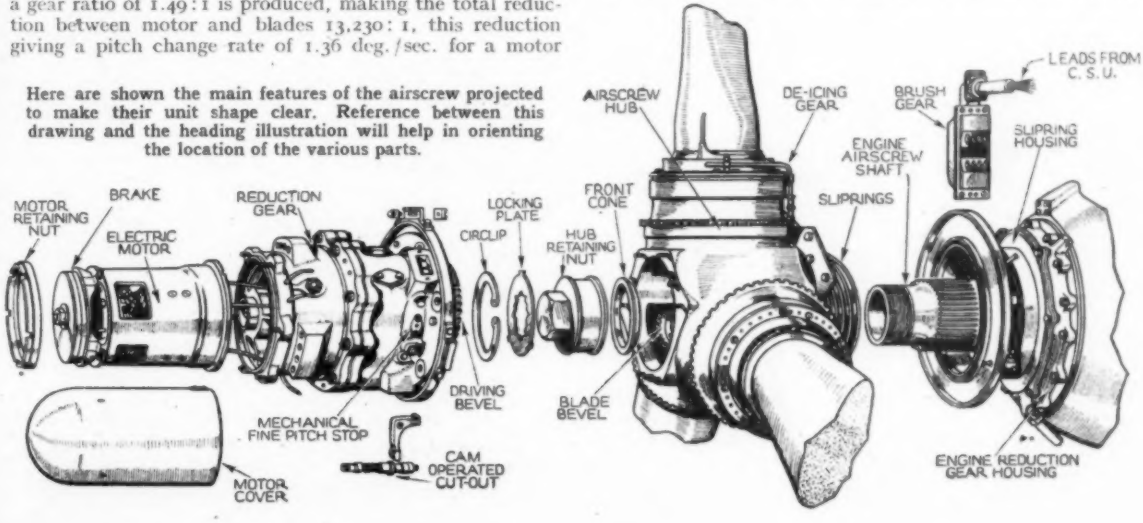
The blades fit into the short barrels of the hub, which are internally threaded to accept the bearing housings. Four ball races comprise each blade-bearing stack and are located between the bearing housing and the blade-root adaptor, in the base of which is screwed the bevel segment through which pitch change motion is transmitted. The hub shell embodies a central buttressed and internally spined sleeve, which protrudes about half-way into the hub interior to take the airscrew shaft. As is the usual practice, the static and thrust loads of the airscrew are taken on two annular cone seatings, one at the rear and one at the front of the airscrew shaft, the splining between shaft and hub merely transmitting torque.

Pitch-change Mechanism

On the front of the hub is bolted the pitch-change mechanism, consisting of a reversible electric motor and a compound epicyclic reduction gear giving a ratio of 8,880: 1. The output side of this reduction gear terminates in a helical-toothed bevel wheel—called the power bevel—which is in mesh with the blade bevels. As the power bevel has 39 teeth and the blade bevels have 58-tooth pitch, a gear ratio of 1.49:1 is produced, making the total reduction between motor and blades 13,230: 1, this reduction giving a pitch change rate of 1.36 deg./sec. for a motor speed of 3,000 r.p.m. The series-wound 24-volt motor is driven direct from the aircraft batteries, consuming about 10 amps. at 3,000 r.p.m., and has two sets of field windings to allow reversible rotation. A drum-type armature is employed, each of the four radial brushes having a spring pre-loading of 27 oz. in order to compensate centrifugal force generated by airscrew rotation. Carried on front of the motor is a solenoid-operated brake consisting of a fixed and a movable plate each faced with a Ferodo lining. When the pitch angle of the blades is changed to effect the maintenance of constant engine speed, the solenoid is energised and attracts the movable brake plate and the motor is then free to turn. Immediately the requisite pitch angle is obtained, the brake circuit and the motor circuit are broken and the brake is automatically and instantaneously applied. It is impossible for the centrifugal twisting moment of the airscrew blades to overcome the brake owing to the mechanical advantage the latter possesses by virtue of the extreme reduction ratio between motor and blades.

Current is supplied to the airscrew from the standard aircraft batteries via the constant-speed governor unit. On the rear of the airscrew hub are mounted four slip rings of hardened bronze, separated and insulated by micarta rings. Each slip ring serves a separate function, the circuits being (i) Fine pitch; (ii) Coarse pitch; (iii) Feathering; and (iv) Negative return. From the governor unit the leads are taken to a brush gear mounted on the slip-

Here are shown the main features of the airscrew projected to make their unit shape clear. Reference between this drawing and the heading illustration will help in orienting the location of the various parts.



MODERN AIRSCREWS—II

ring housing and incorporating four pairs of spring-loaded carbon brushes which bear against their respective slip rings. In this way the current is relayed from the static source to the rotating body of the airscrew.

Connection between the slip rings and the airscrew motor is made by means of insulated connector rods which pass through axial drillings in the hub shell and terminate at their forward ends in tungsten tips. These tips bear against spring-loaded heads from which leads are taken to the motor. Located in each spring-loaded head is one arm of a bell crank, the other arm of which is in contact with an annular cam attached to the main power bevel. By this means, when the blades have reached their nominal limit of travel in coarse pitch, or their positive limit in fine pitch, the cam actuates the appropriate bell crank, so breaking the respective circuit and preventing further pitch rotation of the blades. In addition to the cam circuit breaker, a mechanical fine pitch stop is fitted as a safety measure.

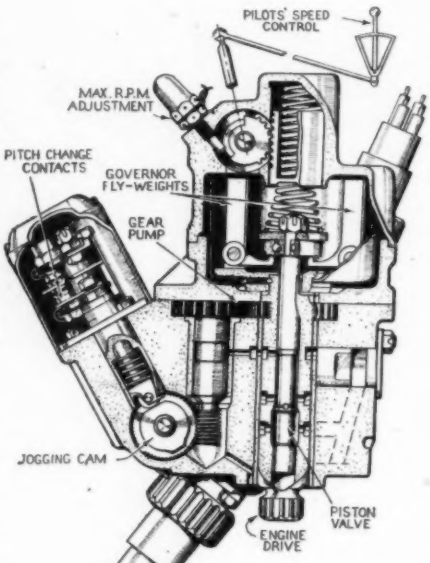
The constant speed governor unit is engine driven and utilises the action of centrifugal fly weights to control the distribution of current to increase or decrease pitch of the blades as engine speed tends to fall or to rise. Incorporated in the c.s.u. is a gear-type pump to which engine oil is fed at the normal lubrication system pressure. The c.s.u. pump ensures an even, constant oil delivery, irrespective of variations in engine speed and, after stepping-up the pressure feeds the oil, via a piston valve controlled by the fly-weight governor, to a spring-loaded piston balanced against engine oil pressure. This piston carries a contact arm connected with the positive supply from the electric batteries, and the contact moves between two "fixed" contacts, one for the fine and one for the coarse pitch circuits.

Although the fine and coarse circuit contacts are called "fixed," they are actually in constant movement over a very small range of travel. Off the idler wheel of the c.s.u. pump is taken a spindle having a worm thread which meshes with a pinion to rotate a cam. Bearing against this cam is a spring-loaded follower mounted on the shaft carrying the "fixed" contacts. The reason for this is that a very slight change in engine r.p.m. is quite enough to cause the piston to move the centre arm into contact with one of the "fixed" arms, but by arranging the "fixed" arms to move very slightly, the contact for only a slight r.p.m variation is momentary and over-correction of blade pitch is thus avoided.

Pilot's Control

When large variations in r.p.m. are made, the centre contact is held against the appropriate "fixed" contact until the blades have nearly reached the desired setting. The piston then once more moves to its balanced position and the intermittent make and break again ensures accurate pitch setting with no resultant "hunting" variations of engine r.p.m.

The pilot's speed control lever is linked to a racked sleeve in the c.s.u. bearing against a spring, the exertion of which balances the effect of the fly-weights. Thus, movement of the pilot's control varies the spring pressure which determines, in counterbalance with the fly-weights, the distribution of oil through the valve to the pitch-change piston, and so governs the speed at which the engine is to run. In addition to the speed control lever, mounted on the pilot's instrument panel, is a selector switch by means of which the airscrew can be operated as a fixed-pitch unit. The selector switch is of the three-way toggle type, and when in the upward, "automatic," position, the airscrew is controlled by the constant-speed unit. In the central position the electrical circuit is open, the motor brake on, and the blade pitch fixed. From the central position the switch can be depressed either to left or right in order to engage the coarse or fine pitch circuits respectively.

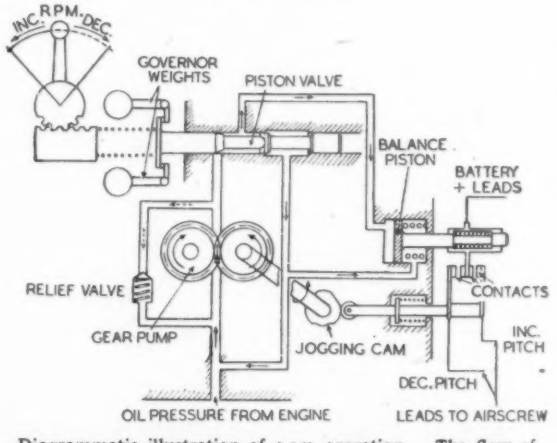


The constant-speed unit. The construction of the c.s.u. and its operation should be clarified by this illustration; the electrical leads are from the aircraft batteries and to the airscrew pitch-change motor.

Also on the pilot's panel—of multi-engined aircraft—is a quick-feathering switch controlling a voltage booster. The booster is in series with the batteries and raises the normally available 24 volts supply by 72 volts up to 96 volts, which is delivered to the pitch-change motor through the separate feathering slip ring. Feathering by this means takes approximately eight seconds, but feathering by the ordinary manual selector switch takes about half a minute. The effect of the increased voltage is to rotate the pitch-change motor at 12,000 r.p.m. at which speed it consumes 140 amps., very light payment for the ability to feather in so short a period.

We have not, so far, considered the application of changing-blade pitch to effect negative thrust. By this is meant the rotation of the blades through fine pitch, and beyond zero pitch until the thrust is negative, or reversed. The ability to do this was at first conceived as a means of slowing an aircraft's diving speed, but there are many attendant difficulties in this application of the idea which at the moment render it impractical. Nevertheless, great use has been found for reversed thrust applied as an aerodynamic brake on the ground for shortening landing runs, and also as a help in manœuvring flying boats upon the water.

(To be continued)



Diagrammatic illustration of c.s.u. operation. The flow of oil through the unit and the way in which it governs the feed of current to increase or decrease engine r.p.m. can be understood.

Simple Flying-boat Beaching

Small Ground Crews Suffice

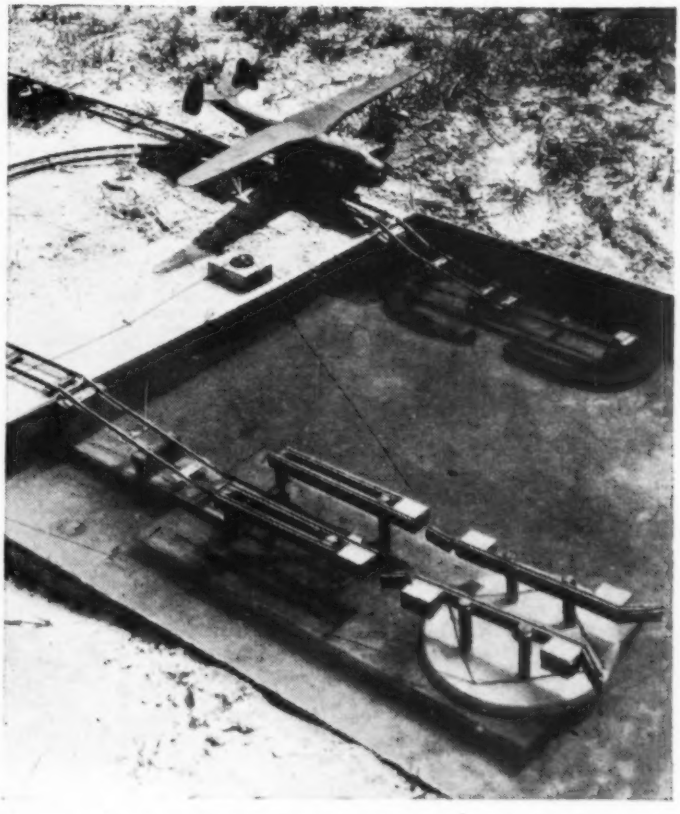
A METHOD for the rapid and safe beaching of the largest types of flying boats without employment of large crews has been devised by Lieutenant Frank J. Walters, U.S.N., at the Naval Air Station, Banana River, Florida.

The installation, of which Lieut. Walters has constructed a working model using a model Martin Mariner for demonstration purposes, consists mainly of a ferry-type slip mounted on floats, a set of guides, a cradle and rails. A turntable approach section may be substituted for the ferry slip. Both turntable and slip conform automatically to the tide and are adjusted to wind direction by means of winches. Likewise, the guides are adjustable to various sizes of flying boats, so that the same installation could be used for both the Mariner and the Mars.

Need for men to swim or wade in cold water with beaching gear is entirely eliminated. The whole beaching operation is handled by the pilot and one or two men on the beach.

The flying boat approaches the ferry slip or turntable in the same manner it would a beaching buoy. As the machine enters the slip or turntable, it is turned until aligned with the guides, then, taxying forward, assumes a position directly above the cradle and a hook suspended from the tunnel hatch then engages an extension on the rear of the cradle.

As aircraft and cradle move forward between the guides, the cradle begins ascent of an incline until it finally supports the aircraft which may go up the side under its own power or with the help of a winch. Once on the beach it may rapidly be moved on rail tracks to loading platforms.



For launching, the hook is removed and the flying boat taxies over the side, the cradle dropping away when the machine becomes waterborne.

Approach and guide units may be used as aircraft docks by adding bumper pads and sidewalks on the uprights, and the necessity for rails for the cradle may be eliminated by use of wheels running in U channels.

Lieut. Walters points out that seaplane weight would be less because there would be no need for heavy beaching gear fittings on the hull. Also, the weight of the plane would be distributed over a greater area when not waterborne and the need for constructing the hull to meet beaching gear stresses and strains would be eliminated.

GAS TURBINE ENGINES

GAS turbine aircraft engines of as much as 10,000 horse-power will be available for giant aircraft within the next decade, according to G. W. Vaughan, president of the Wright Aeronautical Corporation, who announced that the company will produce aviation turbines as well as conventional-type engines in the post-war period. Development of a turbine of this power would mean more energy in one unit than in all four engines of the largest bomber now in use, i.e., the Boeing B-29 Superfortress fitted with four Cyclone engines totalling 8,800 horse-power.

At a Press conference marking the 25th anniversary of Wright Aeronautical, Mr. Vaughan indicated that research and development programmes are now under way on turbine units. Marking what is claimed as one of the biggest advances in aviation since the radial engine first appeared, one type of Wright gas turbine will be an engine of high power, built to drive an airscrew, as contrasted with the turbine units of basically similar principle used in jet-propulsion aircraft. This type of engine has been proposed for many years, but so far has never been flown. For reasons of military security, no additional details of the Wright turbines were released.

It was stated that while the principles of gas turbines had been known for years, it was only recently that research had improved their efficiency to a point of practical use, and only recently that advances in metallurgy had provided the metals to withstand the heat and power stress of such engines.

"Within a few years from to-day the turbine form of power may advance aviation much as did the radial."

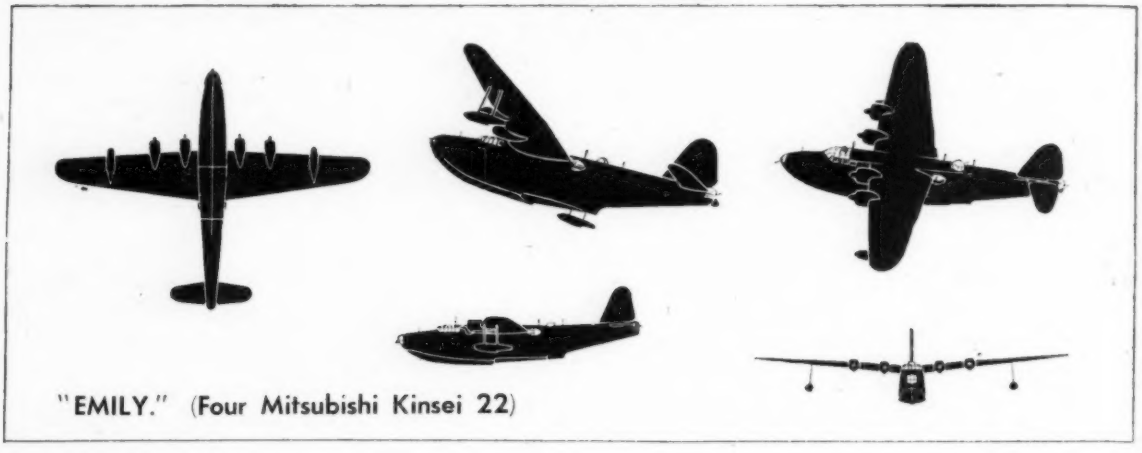
Wright Aeronautical will still continue production of air-cooled radials, according to Mr. Vaughan, as well as continuing development and research work on other projects as yet not announced. "For commercial and military use," he said, "we foresee a strong need for radial engines of from about 4,000 to 5,000 horse-power. These engines will power feeder and trunk line transport, cargo carriers of all types, and certain types of military aircraft. In the higher power range the gas turbine has many advantages. It offers a large saving in weight and fuel consumption for long-range, high-speed operation at altitude."

Pointing out that the lightest-weight engine per horse-power in use to-day is the Cyclone 9, which weighs only 0.97 lb. per horse-power, Mr. Vaughan said that the gas turbine offers the possibility of decreasing engine weight well below this mark. On a giant transport aircraft of the future the turbine engine may mean a saving of as much as 8,000 lb. over present types of engines, permitting approximately 40 additional passengers on each flight or four extra tons of cargo. Such increases in efficiency may make possible reductions in rates.

Air Comdre. Frank Whittle, as recorded elsewhere in this issue, recently spoke of the gas turbine's possibilities.

Studies in Recognition

Aircraft in Flying Attitudes



"EMILY." (Four Mitsubishi Kinsei 22)

IT would be difficult to find two aircraft in opposing forces which resemble each other more closely than do the Japanese flying boat "Emily" and the Short Sunderland. The Japs are notorious copyists, but they seem to have excelled themselves at the game in this instance; evidently the "designer" of the "Emily" cherishes a genuine admiration for the British Sunderland, and has been particularly flattering in the extent to which he has carried imitation.

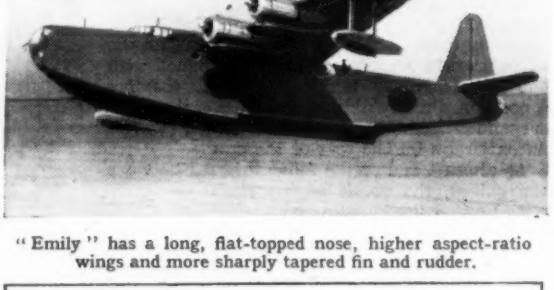
Fortunately, however, there are a number of small but discernible points on which these two flying boats differ—we are considering their visible externals for recognition purposes, of course, for they may also differ constructionally—so by getting these points firmly fixed in one's mind, any risk of attacking an R.A.A.F. Sunderland in error should be avoided.

"Emily," which is the code name bestowed on the type by the Americans for ease of reference, is of Kawanishi manufacture and is officially designated the Navy 2 flying boat. It is one of their latest imitations, and succeeds the "Mavis" or T-97 flying boat which, it will be remembered, has a parasol wing. Saying it is an imitation, by the way, is not meant to imply that it is no good; most Jap aircraft have turned out to be a great deal better machines than pre-war stories would have had us believe. In fact, the Japs themselves minimised their air potential for reasons that have since become obvious.

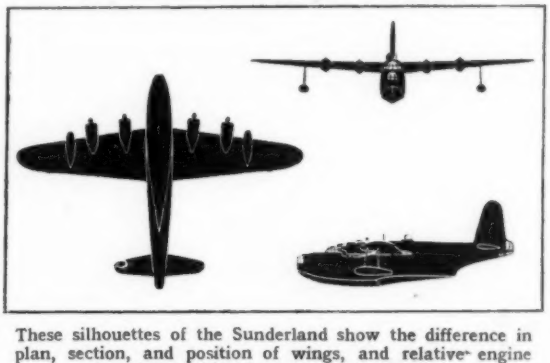
In general, the essential difference between the "Emily" and the Sunderland is that the Jap flying boat is of slimmer proportions. The high cantilever wing tapers to small rounded tips as does that of the Sunderland, but it is of appreciably higher aspect-ratio. The hull, too, is less deep in proportion to the length than the Sunderland hull, particularly in the nose and 'midships sections. Gun turrets are mounted in the nose, dorsal and tail positions, and there are also blisters which may be chiefly for observation purposes, but are capable of mounting hand-operated waist guns.

Three more points are worth noting about the "Emily's" wings. As will be seen by comparing the photographs and silhouettes, they are set appreciably further back on the hull than are those of the Sunderland (giving the effect of a longer nose in plan view), they are slightly gulled when seen from dead ahead or astern, and have a thinner aerofoil section than Sunderland wings, especially at the roots.

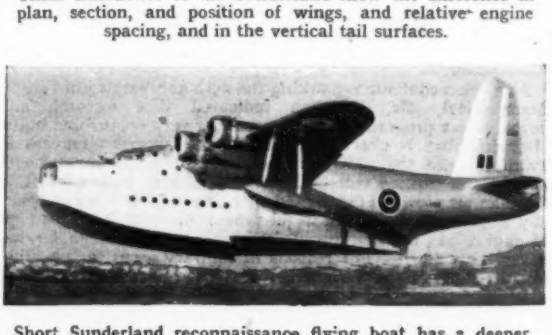
From the head-on view also, another difference is apparent—the radial engines of the "Emily" appear, due to its 12ft. greater span, to be set closer to the hull than those of the Sunderland. Observe, too, that the cross-section of the hulls shows a radius on the Sunderland's flanks, but a straight "tumble home" on the Jap boat. Dimensions of the "Emily": Span 124ft., length 96ft. 6in.



"Emily" has a long, flat-topped nose, higher aspect-ratio wings and more sharply tapered fin and rudder.



These silhouettes of the Sunderland show the difference in plan, section, and position of wings, and relative engine spacing, and in the vertical tail surfaces.



Short Sunderland reconnaissance flying boat has a deeper hull amidships and taller fin and rudder.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers not necessarily for publication, must in all cases accompany letters.

JET PROPULSION

Advantage of Wing-mounted Units

SINCE reading the query by C. Charles (*Flight*, October 19th) I have been comparing available data about jet-propelled aircraft, and would like to offer your correspondent a few comparisons to think over.

One of the primary needs of a fighter plane is room for heavy armament. The Bell Airacomet, the Messerschmitt 262 and the Heinkel 280, by reason of the position of their propulsion units, can have their main armament concentrated in the nose, with the additional advantage of probably being able to carry more ammunition. Nose armament cannot be fitted to the Gloster jet plane, owing to the presence of its large air intake.

The twin-jet aircraft probably allows for more tankage space and easier design in finding accommodation for the pilot and equipment, and it is possible to house the nose wheel of a tricycle undercarriage with ease. The difficulty of installing a tricycle undercarriage in a single-jet aircraft has been neatly overcome by the Gloster Company, but the Italians apparently did not attempt to solve the problem in the Caproni Campini C.C.1, and the Me 163, although without an air intake, being rocket-propelled, has, I believe, skids fitted beneath the fuselage.

As C. Charles says, wing-mounted propulsion units increase head resistance. This increase is at least somewhat alleviated by a much sleeker fuselage, as with the Me. 262 "Swallow" and the Airacomet. There is also the disadvantage of having to mount engines low on the wings, necessitating a larger undercarriage, or, alternatively, to fit the tailplane high on the fin in order that the spent gases may safely flow clear of the tail unit.

Other readers will, no doubt, be able to think of several more comparisons, and I believe the evidence will go to show that the design of multi-engined jet-propelled aircraft is well justified.

One question about the Messerschmitt 163 which someone may be able to answer is, what takes the place of elevators on the Me. 163 if, as has been suggested, it is without a tailplane? Are extra control surfaces fitted to the wings?

R. L. GLADWELL.

WHEN WE WERE YOUNG

A 1910 Flip in the Avro Triplane

AFTER reading this week's copy of *Flight* (Oct. 19th) and seeing the front cover, I perused some old motor cycling volumes and was much amused at the following description of a motor cyclist's trip in Mr. A. V. Roe's triplane at Brooklands—the date was July, 1910.

"Later in the afternoon Mr. A. V. Roe succeeded in obtaining his pilot's certificate on his triplane fitted with an eight-cylinder air-cooled J.A.P. engine. It was with trepidation that I accepted a ride in his big passenger-carrying machine.

"'Jump in front' was his first remark, but this was easier said than done. There was a tiny iron step about 4ft. from the ground, and after this I had to be careful where I trod, as the body part of the machine seemed made of matchwood, much like a racing sculling boat.

"My seat was right forward just behind the engine, with a good stout crosspiece to hang on to. My legs were too long, and it took some time to compress those unaccustomed limbs into the space provided for them. Then Roe mounted with a bound and asked me to turn on the petrol, which was in a tank over my head. I did so. 'All right,' shouted Roe. There was a roar and a blast of wind from the mighty propeller and we were off. Roe screamed out that he was going to run down the ground and go up against the wind on the return journey. Accordingly we pranced over the green field with the engine running in jerks. Having arrived at the other end of the flying ground Roe turned sharply, and suddenly opened the machine right out. The racing of the engine and the noise of the exhaust at once gave me the idea of a slipping belt or clutch—such is the motor bicyclist!

"The great wind from the propeller made it difficult to look ahead, but I could feel every now and then the machine jumping to get free of the earth. Then she took the air. It was magnificent. A feeling of a mighty power, serene and strong, superior to all nature, took hold of me. We were up in the machine, flying as steadily and evenly as a bird, with no fear of accident whatever.

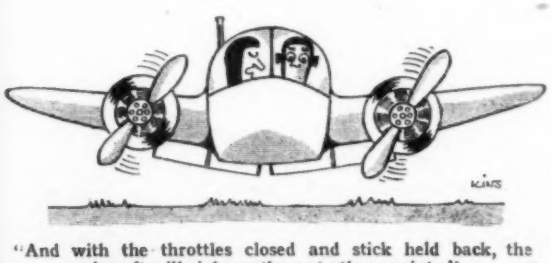
"Flying oil and boiling water were blown back in our faces, whilst the wind was whistling through the planes. But when once up I did not notice the wind at all. I looked down. We were about 10ft. up with the green turf flying away below. The supreme madness of flying. Oh, to soar for miles and miles into the heights of heaven! This was better than motor-bicycles. Let me have more and more!

"Then the power fell off and we came down, but so smoothly that I did not know we had touched old Mother Earth again. Those few brief moments of absolute bliss and exhilaration, combined with that feeling of safety and repose, were the time of a life. Roe slowly brought his wonderful triplane round before the wind by alternately switching the engine on and off and brought me back again to the sheds."

We certainly have improved since the days of flying oil and boiling water in one's face!

A. D. McKECHNIE, Lt. Col.

[The engine of this famous aircraft was, as older readers will recall, an 8-9 h.p. air-cooled V-twin J.A.P. motor cycle engine; *not* an 8-cylinder engine as stated.—ED.]



"And with the throttles closed and stick held back, the aircraft will sink gently on to three points."

TO-MORROW'S LIGHT AIRCRAFT

Properly Designed Comfort Improves Control

I HAVE read "Indicator's" article in your issue of October 19th with great interest, but I really cannot see why to-morrow's light aircraft cannot be made as comfortable as to-day's light car.

Why cannot you have comfort and control? Personally, I hold the view that properly designed comfort can mean more control. I agree we do not want to sacrifice control for comfort, and if it were a question of either comfort or control, then truly we would have to do without comfort. But is this the case?

Is not "Indicator" proposing to freeze light aircraft design in the "cyclecar" stage? In pre-war years we loved our Moths and Avians and Swallows, just as years ago we loved our Amilcars and Salmsons and G.N.s. They all had delightful control characteristics and we shuddered at the shocking instability of the saloon cars of the period. But to-day one must admit that the small family saloon can be driven any given 100 miles in much the same time as could our little near-racing cars of 20 years ago, and with far less physical and mental strain. And how on earth are you going to make an air-minded nation by suggesting to the "amateur" (why "amateur"? We don't have amateur motorists) continuously that his aircraft is a fragile contraption precariously battling with gravity? It is nothing of the sort. It can be designed to withstand G, which would drain "Indicator" himself out through his own boots. And I did not think anybody to-day thought speed, as such, was lethal. Surely it depends on your ability to control it. A car travelling at 30 m.p.h. with no brakes is more lethal than one travelling at 60 m.p.h. with good brakes.

So don't let's tell our "amateur" his speed is lethal, but give him an aircraft with a reasonable and practicable speed range, shall we say as near zero as possible at one end to 100 m.p.h. or so at the other.

I agree entirely with "Indicator" about providing knee and elbow room and about putting knobs and levers in the right place. This, of course, is all part of the comfort story and an open minded and unorthodox approach to the subject is needed.

J. S. POLE.

FIVE-TON LORRIES : The Lancasters bombing the Ruhr cities are now carrying nearly 5 tons of bombs per aircraft.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

Promotions

AIR MARSHAL H.R.H. the DUKE OF GLOUCESTER, K.G., K.T., K.P., G.C.B., G.C.M.G., G.C.V.O., A.D.C., to be Air Chief Marshal. October 27th, 1944.

GENERAL DUTIES BRANCH.

Air Commodores (temp.) (Act. Air Vice-Marshals) are granted the rank of Air Commodores (war subs.).

A. L. PAXTON, D.F.C. Sept. 5th, 1944.
C. B. S. SPACKMAN, D.F.C. Sept. 13th, 1944.
S. P. SIMPSON, C.B., C.B.E., M.C. Sept. 14th, 1944.

Appointments

The Air Ministry announces the following appointments :—

Air Vice-Marshal J. H. D'ALBIAC, C.B., D.S.O., to Permanent Commission Selection Board, Directorate General of Personal Services, Air Ministry.

Act. Air Vice-Marshal A. P. DAVIDSON, C.B.E., to special duties with Control Commission, Military Section, Air Force Planning Staff.

Air Comdre. P. H. MACKWORTH, C.B.E., D.F.C., to be Commandant, Empire Central Navigation School.

Air Comdre. A. H. WANN to Directorate-General of Personal Services, Air Ministry (Morale and Rehabilitation).

Air Comdre. L. DARVALL, M.C., to be A.O.C. of a Group in Transport Command.

Air Comdre. N. L. DESOER to be A.O.C. of a Group, A.C.S.E.A.

Air Comdre. H. F. FULLER to be Command Accountant, Technical Training Command.

Air Comdre. S. G. LEE, M.C., to Headquarters, Mediterranean Allied Air Force.

Act. Air Comdre. A. FLETCHER, C.M.G., C.B.E., M.C., to be Deputy Senior Air Staff Officer on liaison with B.O.A.C., H.Q. Transport Command.

Act. Air Comdre. G. D. HARVEY, C.B.E., D.F.C., to Permanent Commission Selection Board, Air Ministry.

Act. Air Comdre. G. H. EWING, O.B.E., to be O.C. (Engineering) of a Maintenance Unit in A.C.S.E.A.

Act. Air Comdre. N. A. P. PRITCHETT to be Senior Air Staff Officer of a Group in Coastal Command.

Air Vice-Marshal D'ALBIAC has been Deputy Commander, Mediterranean Allied Tactical Air Force, since February this year. Prior to that he had been Air Officer Commanding the home-based 2nd Tactical Air Force from its formation in 1943. He was awarded the D.S.O. in 1916, and was made C.B. in 1941. Last September he was given the U.S. Legion of Merit (Commander).

Air Vice-Marshal DAVIDSON has been Air Officer Commanding in Iraq and Persia since last February. He was made C.B.E. in 1941, and holds the Polish Croix des Vaillants.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy :—

Bar to Distinguished Service Order

Act. Group Capt. P. G. WYKEHAM-BARNES, D.S.O., D.F.C., R.A.F.—This officer has displayed the highest qualities of skill, gallantry and devotion to duty. He is a masterly leader whose good judgment and undoubted tactical ability have been reflected in the operational efficiency of the squadrons he commands. Since the landing in Northern France the squadrons have completed very many sorties and have achieved much success. Group Capt. Wykeham-Barnes has participated in many of these missions, especially the more difficult of the assignments, and throughout his example has inspired all.

Distinguished Service Order

Act. Wing Cdr. G. C. KEEFER, D.F.C., R.C.A.F.—This officer has completed many sorties since being awarded a bar to the D.F.C., and his record is outstanding. Within the past few months he has led large formations of aircraft on air operations during which 40 enemy aircraft have been destroyed. The successes obtained reflect the greatest credit on the skill, gallantry and resolution of Wing Cdr. Keefer. This officer has been responsible for the destruction of eight hostile aircraft.

Act. Wing Cdr. D. D. HAIG, D.F.C., R.A.F., No. 625 Sqn.—Wing Cdr. Haig has consistently displayed the highest standard of leadership, skill and gallantry. He has completed very many sorties, including attacks against strongly defended targets in Germany and the occupied countries. On a recent sortie, although his aircraft was severely damaged by anti-aircraft fire, by brilliant airmanship, he flew the aircraft safely back to this country and made a skilful landing. Since assuming command of his squadron Wing Cdr. Haig has maintained a high standard of efficiency and morale. He has set a fine example.

Act. Wing Cdr. D. M. WALBOURN, R.A.F.V.R., No. 582 Sqn.—Wing Cdr. Walbourn has completed much operational flying against a variety of heavily defended targets in Germany. He has at all times displayed the highest standard of courage and resolution in pressing home his attacks, and his achievements are worthy of high praise. Wing Cdr. Walbourn is a fine leader and an invaluable officer to his squadron.

Bar to Distinguished Flying Cross

Act. Sqn. Ldr. G. CAMPBELL, D.F.C., R.A.F., No. 226 Sqn.—Sqn. Ldr. Campbell has completed many sorties against a variety of targets by day and night. In August, 1944, he was detailed for an operation against a ferry at Duclair. Despite heavy anti-aircraft fire the attack was pressed home with good results. Shortly after the bombs had fallen the aircraft was struck. It immedi-

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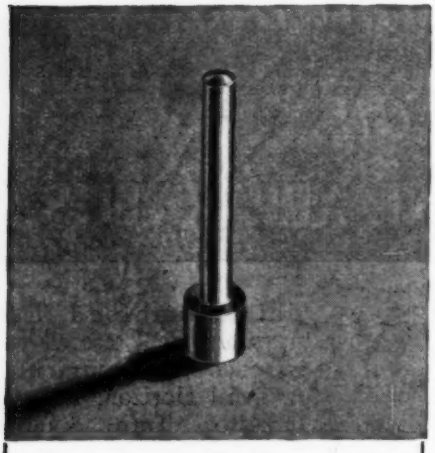

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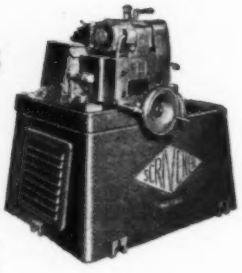

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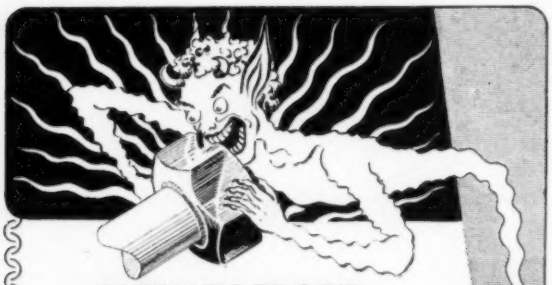

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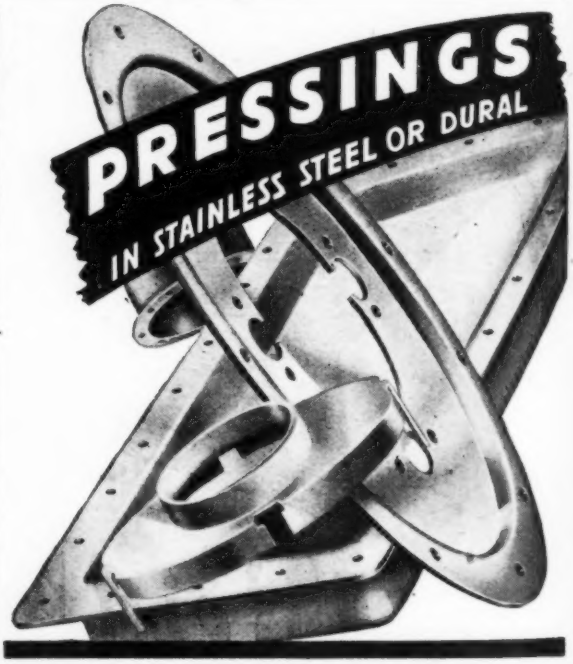

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ately became almost uncontrollable, and height was lost rapidly. Petrol poured from the pierced tanks, and the starboard engine caught fire. The situation seemed hopeless. Coolly and skilfully, however, Sqn. Ldr. Campbell effected a crash-landing. As the aircraft touched down it burst into flames. All the crew, with the exception of the top gunner, had got clear. Without hesitation, Sqn. Ldr. Campbell entered the wreckage in order to release his comrade. Unfortunately he had succumbed. This brave pilot displayed conduct in keeping with the best traditions of the R.A.F.

Distinguished Flying Cross

Flt. Lt. L. G. NEILLY, R.C.A.F., No. 6 (R.C.A.F.) Sqn.
Flt. Lt. A. W. JENNINGS, R.A.F.V.R., No. 433 (R.C.A.F.) Sqn.
F/O. A. L. BUTLER, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
F/O. R. W. KENT, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
F/O. W. MACKAY, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
F/O. R. C. PENROSE, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
F/O. J. F. TEES, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
F/O. J. WAGMAN, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
F/O. C. R. CHORLEY, R.A.F.V.R., No. 622 Sqn.
F/O. J. E. COWELL, R.A.A.F., No. 15 Sqn.
P/O. H. D. EGLI, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
P/O. J. G. M. LANDRY, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
W/O.1 (now P/O.) A. V. J. BOYER, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
P/O. F. J. MCGOVERN, R.A.F.V.R., No. 426 (R.C.A.F.) Sqn.
P/O. H. S. SMITH, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
W/O.2 (now P/O.) J. A. RYAN, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
F/O. R. G. HOLDEN, R.C.A.F., No. 431 (R.C.A.F.) Sqn.
F/O. R. H. SIMPSON, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
Flt. Lt. A. D. BEATTY, R.A.F.V.R., No. 206 Sqn.
Flt. Lt. L. R. COLQUHOUN, D.F.M., R.A.F.V.R., No. 682 Sqn.
Flt. Lt. S. C. COX, D.F.M., R.A.F.V.R., No. 26 Sqn.
Flt. Lt. A. JACQUES, R.A.F.V.R., No. 235 Sqn.
Flt. Lt. R. E. REYNOLDS, R.A.F.V.R., No. 255 Sqn.
Flt. Lt. A. K. SHERWOOD, R.A.F.V.R., No. 120 Sqn.
Flt. Lt. N. W. THOMAS, R.A.F.V.R., No. 150 Sqn.
Flt. Lt. P. C. TIPPLE, R.A.F.V.R., No. 272 Sqn.
Flt. Lt. A. R. W. HAYES, R.A.F.V.R., No. 40 Sqn.
Flt. Lt. E. H. THOMAS, R.A.F.V.R., No. 144 Sqn.
F/O. A. J. W. CROFTON, R.A.F.V.R., No. 540 Sqn.
F/O. B. K. DAVIES, R.A.F.V.R., No. 683 Sqn.
F/O. G. A. MARTIN, R.A.F.V.R., No. 73 Sqn.
F/O. R. E. GILLMAN, D.F.M., R.A.F.V.R.
F/O. H. HOLLINSON, R.A.F.V.R., No. 235 Sqn.
F/O. C. K. MCPHERSON, R.A.F.V.R., No. 53 Sqn.
F/O. D. G. MADDOCKS, R.A.F.V.R., No. 236 Sqn.
F/O. D. MARROW, R.A.F.V.R.
F/O. D. MCK. MUIR, R.A.F., No. 224 Sqn.
Flt. Lt. A. P. MORGAN, R.A.F., No. 544 Sqn.
F/O. W. TYLER, R.A.F.V.R., No. 119 Sqn.
P/O. C. W. V. BASS, R.A.F.V.R., No. 142 Sqn.
P/O. T. W. CHAPMAN, R.A.F., No. 120 Sqn.
P/O. D. B. MCNEIL-WATSON, R.A.F.V.R., No. 119 Sqn.
P/O. T. A. MILLER, R.A.F.V.R.
P/O. M. G. MOSELEY, R.A.F.V.R., No. 86 Sqn.
P/O. J. L. POVEY, R.A.F.V.R., No. 624 Sqn.
W/O. N. M. MCL. MARTIN, R.A.F.V.R., No. 235 Sqn.
W/O. H. J. F. WILLIAMS, No. 86 Sqn.
Sqn. Ldr. D. M. HANNAH, R.A.A.F., No. 502 Sqn.
F/O. R. R. ALEXANDER, R.A.A.F., No. 461 (R.A.A.F.) Sqn.
F/O. L. F. MCINNES, R.A.A.F., No. 461 (R.A.A.F.) Sqn.
Flt. Lt. I. H. ROEDIGER, R.A.A.F., No. 3 Sqn.
F/O. J. W. MCKAY, R.A.A.F., No. 612 Sqn.
F/O. J. C. PITTMAN, R.A.A.F., No. 150 Sqn.
F/O. L. R. RICHARDS, R.A.A.F., No. 150 Sqn.
F/O. W. Y. RICHARDSON, D.F.M., R.A.A.F., No. 254 Sqn.
F/O. E. B. RIDGWAY, R.A.A.F., No. 254 Sqn.
F/O. A. T. WHEELER, R.A.A.F., No. 614 Sqn.
P/O. T. J. WASSON, R.A.A.F., No. 40 Sqn.
W/O. (now P/O.) R. J. LEFTWICH, R.A.A.F., No. 142 Sqn.
W/O. I. J. F. REDDEN, R.A.A.F., No. 40 Sqn.
W/O. (now P/O.) R. L. SEDGER, R.A.A.F., No. 150 Sqn.
Sqn. Ldr. T. H. CURLEE, R.C.A.F., No. 39 Sqn.
Sqn. Ldr. W. B. HAY, R.C.A.F., No. 417 Sqn.
Flt. Lt. W. N. HARRIS, R.C.A.F., No. 544 Sqn.
Flt. Lt. A. H. JACKSON, R.C.A.F., No. 210 Sqn.
Flt. Lt. E. W. WISKIN, R.C.A.F., No. 162 Sqn.
Flt. Lt. D. SINCLAIR, R.C.A.F., No. 249 Sqn.
F/O. S. MACM. CARTER, R.C.A.F., No. 150 Sqn.
F/O. I. GLEN, R.C.A.F., No. 683 Sqn.
F/O. G. P. MCNULTY, R.C.A.F., No. 162 (R.C.A.F.) Sqn.
F/O. H. E. TOMPKINS, R.C.A.F., No. 682 Sqn.
W/O. (now P/O.) R. I. STERLING, R.C.A.F., No. 624 Sqn.
W/O. P. R. VALENTINE, R.C.A.F., No. 13 Sqn.
F/O. W. A. FRASER D.F.M., R.N.Z.A.F., No. 489 (N.Z.) Sqn.

THREE-IN-ONE CREW: (Left to right) F/O. D. W. Cuthbert, Wing Cdr. H. W. Connolley and Flt. Lt. E. S. Ludbrook, all of the same aircrew, who received the D.F.M. and two D.F.C.s respectively at a recent investiture held at Buckingham Palace.

F/O. C. A. HYND, R.N.Z.A.F., No. 624 Sqn.
P/O. W. A. TONG, R.N.Z.A.F., No. 150 Sqn.
W/O. F. E. HALL, R.N.Z.A.F., No. 489 (N.Z.) Sqn.
Capt. R. O. FLETCHER, S.A.A.F., No. 60 (S.A.A.F.) Sqn.
Capt. A. E. MCLEAN, S.A.A.F., No. 112 Sqn.
Capt. R. D. B. MORTON, S.A.A.F., No. 4 (S.A.A.F.) Sqn.
Capt. W. P. WITKNER, S.A.A.F., No. 1 (S.A.A.F.) Sqn.
Lt. R. V. LYON, S.A.A.F., No. 241 Sqn.
Lt. J. H. SMITH, S.A.A.F., No. 31 (S.A.A.F.) Sqn.
Sqn. Ldr. J. W. H. HARWOOD, D.F.M., R.A.F.V.R., No. 76 Sqn.
Sqn. Ldr. D. R. STUBBS, R.A.F.V.R., No. 50 Sqn.
Sqn. Ldr. J. E. WHITE, R.A.F.V.R., No. 44 Sqn.
Flt. Lt. L. A. P. BURRA-ROBINSON, R.A.F.V.R., No. 65 Sqn.
Flt. Lt. W. R. CHRISTISON, R.C.A.F., No. 404 Sqn.
Flt. Lt. B. G. COLLYNS, R.N.Z.A.F., No. 19 Sqn.
Flt. Lt. B. J. DOBSON, R.A.F.V.R., No. 44 Sqn.
Flt. Lt. G. GREGORY, R.A.F.V.R., No. 236 Sqn.
Flt. Lt. C. D. AIDNEY, R.A.F.V.R., No. 502 Sqn.
Flt. Lt. M. JOHNSTON, R.N.Z.A.F., No. 15 Sqn.
F/O. G. BUNTING, R.A.F.V.R., No. 228 Sqn.
F/O. C. W. KIPFER, R.C.A.F., No. 106 Sqn.
F/O. W. N. REDMAN, R.A.F.V.R., No. 106 Sqn.
F/O. R. L. MIDDLEMAS, R.A.F.V.R., No. 236 Sqn.
F/O. W. J. MYERS, R.C.A.F., No. 441 (R.C.A.F.) Sqn.
F/O. H. E. SAYEAU, R.C.A.F., No. 106 Sqn.
F/O. R. T. J. HOMES, R.A.F.V.R., No. 101 Sqn.
F/O. J. E. P. OXBORROW, R.A.F.V.R., No. 44 Sqn.
F/O. R. J. WISKER, R.N.Z.A.F., No. 75 (N.Z.) Sqn.
P/O. M. MACNEIL, R.C.A.F., No. 83 Sqn.
W/O. C. A. NEWARK, R.A.F.V.R., No. 75 (N.Z.) Sqn.
W/O. R. WALKER, R.A.F.V.R., No. 455 (R.A.A.F.) Sqn.
Sqn. Ldr. P. BRENTNALL, R.A.F.V.R., No. 219 Sqn.
Sqn. Ldr. G. Y. MACKIE, D.S.O., R.A.F.V.R., No. 115 Sqn.
Sqn. Ldr. D. L. MURGATROYD, R.A.F.V.R., No. 622 Sqn.
Flt. Lt. S. H. ALCOCK, R.A.F.V.R., No. 83 Sqn.
Flt. Lt. D. ALLWOOD, R.A.F., No. 103 Sqn.
Flt. Lt. N. R. ANSTEY, D.F.M., R.A.F., No. 582 Sqn.
Flt. Lt. J. M. W. BRIGGS, D.F.M., R.A.F.
Flt. Lt. D. W. HASELDINE, R.A.F.V.R., No. 419 (R.C.A.F.) Sqn.
Flt. Lt. A. MCCAULEY, R.A.F.V.R., No. 10 Sqn.
Flt. Lt. G. A. WATSON, D.F.M., R.A.F., No. 83 Sqn.
Flt. Lt. H. COATES, R.A.F., No. 640 Sqn.
Flt. Lt. G. P. CULVERHOUSE, R.A.F.V.R., No. 10 Sqn.
F/O. J. K. STOTT, D.F.M., R.A.A.F., No. 617 Sqn.
Wing Cdr. A. J. LEWINGTON, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
Sqn. Ldr. F. V. TAYLOR, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
Flt. Lt. D. C. EVANS, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
Flt. Lt. B. G. HUGHES, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
Flt. Lt. W. L. REINHART, D.F.M., R.C.A.F., No. 109 Sqn.
Flt. Lt. R. P. BAKER, R.C.A.F., No. 15 Sqn.
Flt. Lt. R. T. OBEE, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
Flt. Lt. J. R. WALKER, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
F/O. D. A. BELL, R.C.A.F., No. 617 Sqn.
F/O. W. CONLEY, R.C.A.F., No. 431 (R.C.A.F.) Sqn.
F/O. R. V. DALY, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
F/O. R. DEVITT, R.C.A.F., No. 10 Sqn.
F/O. E. A. MOORE, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
F/O. L. G. MCDONALD, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
F/O. J. PEAKE, R.C.A.F., No. 514 Sqn.
Flt. Lt. M. J. SPARKS, R.N.Z.A.F., No. 15 Sqn.
Sqn. Ldr. P. D. SQUIRES, R.A.F.O., No. 271 Sqn.
Sqn. Ldr. P. WEBB, A.A.F., No. 253 Sqn.
Sqn. Ldr. C. HAW, D.F.M., R.A.F.V.R., No. 129 Sqn.
Sqn. Ldr. G. R. PUSHMAN, R.A.F.O., No. 88 Sqn.
Flt. Lt. I. D. CHARLES, R.A.F.V.R., No. 39 Sqn.
Flt. Lt. E. J. HARROD, R.A.F., No. 267 Sqn.
Flt. Lt. C. C. ISAAC, R.A.F.V.R., No. 148 Sqn.
Flt. Lt. E. MARTIN, R.A.F.V.R., No. 16 Sqn.
Flt. Lt. F. W. PAWSEY, R.A.F., No. 255 Sqn.
Flt. Lt. P. D. PETRIE, R.A.F., No. 16 Sqn.
Flt. Lt. A. V. SANDERS, R.A.F.V.R., No. 266 Sqn.
Flt. Lt. G. F. SILVESTER, R.A.F.V.R., No 32 Sqn.
Flt. Lt. J. H. W. YEATES, R.A.F.V.R., No 487 (R.N.Z.A.F.) Sqn.
Flt. Lt. D. J. DONNET, R.A.F.V.R., No. 264 Sqn.
F/O. J. P. J. BROWNE, R.A.F.V.R., No. 39 Sqn.
F/O. A. B. HARROP, R.A.F.V.R., No. 255 Sqn.
F/O. A. F. HOWLETT, R.A.F.V.R., No. 487 (R.N.Z.A.F.) Sqn.
Flt. Lt. G. W. PUTTICK, R.A.F.V.R., No. 542 Sqn. (since reported missing).
P/O. S. JONES, R.A.F.V.R., No. 267 Sqn.
W/O. A. G. BOWMAN, R.A.F.V.R., No. 255 Sqn.
F/O. J. P. WILLIAMS, R.A.F., No. 267 Sqn., Mediterranean Allied Air Forces.
Flt. Lt. D. W. SAMPSON, R.A.A.F., No. 16 Sqn.
Flt. Lt. H. W. WHEELER, R.A.A.F., No. 39 Sqn.
Sqn. Ldr. A. V. DUNPHY, R.C.A.F., No. 148 Sqn.
Flt. Lt. H. H. MILLER, R.C.A.F., No. 32 Sqn.
Flt. Lt. L. ELLIOTT, R.N.Z.A.F., No. 148 Sqn.
Flt. Lt. G. W. WARDEN, R.N.Z.A.F., No. 267 Sqn.
W/O. T. H. HARRISON, R.N.Z.A.F., No. 253 Sqn.
Lt. R. T. WHITTINGHAM, S.A.A.F., No. 249 Sqn.
P/O. A. J. ANDREWS, R.A.F.V.R., No. 10 Sqn.
P/O. J. ANDREWS, R.A.F.V.R., No. 10 Sqn.
P/O. C. W. ASHTON, R.A.F.V.R., No. 10 Sqn.
P/O. K. A. BOOTH, R.A.F.V.R., No. 51 Sqn.
P/O. J. W. CARR, R.A.F.V.R., No. 10 Sqn.
P/O. G. E. CARTWRIGHT, R.A.F.V.R., No. 10 Sqn.
P/O. K. DYER, R.A.F.V.R., No. 578 Sqn.
P/O. L. FENNY, R.A.F.V.R., No. 10 Sqn.
P/O. L. E. FISHER, R.A.F.V.R., No. 158 Sqn.
P/O. R. E. GILL, R.A.F., No. 10 Sqn.
P/O. B. P. GOLDMAN, R.A.F.V.R., No. 625 Sqn.
P/O. E. F. GROVER, R.A.F.V.R., No. 15 Sqn.
P/O. A. HAMPSON, R.A.F.V.R., No. 10 Sqn.
P/O. G. T. HARE, R.A.F.V.R., No. 51 Sqn.
P/O. R. G. HAYDON, R.A.F.V.R., No. 10 Sqn.
P/O. P. R. JONES, R.A.F.V.R., No. 78 Sqn.
P/O. W. G. R. JONES, R.A.F.V.R., No. 640 Sqn.
P/O. J. KIRTLEY, R.A.F.V.R., No. 10 Sqn.
P/O. R. E. LAKE, R.A.F.V.R., No. 10 Sqn.
P/O. T. L. LEES, R.A.F.V.R., No. 10 Sqn.
P/O. N. H. LLOYD, R.A.F.V.R., No. 44 Sqn.
P/O. M. E. MCCARNEY, R.A.F.V.R., No. 51 Sqn.
P/O. H. W. MILTON.
P/O. P. H. MILLER, R.A.F.V.R., No. 625 Sqn.
P/O. H. L. PATTINSON, R.A.F.V.R., No. 428 Sqn.
P/O. H. V. PEARCE, R.A.F.V.R., No. 77 Sqn.
P/O. A. O. PEARSON, R.A.F.V.R., No. 158 Sqn.
P/O. E. G. POWELL, D.F.M., R.A.F.V.R., No. 115 Sqn.
Flt. Lt. T. JOHNSTON, R.A.F.V.R., No. 640 Sqn.
Flt. Lt. W. SWAIN, D.F.M., R.A.F.V.R., No. 7 Sqn.

SERVICE AVIATION

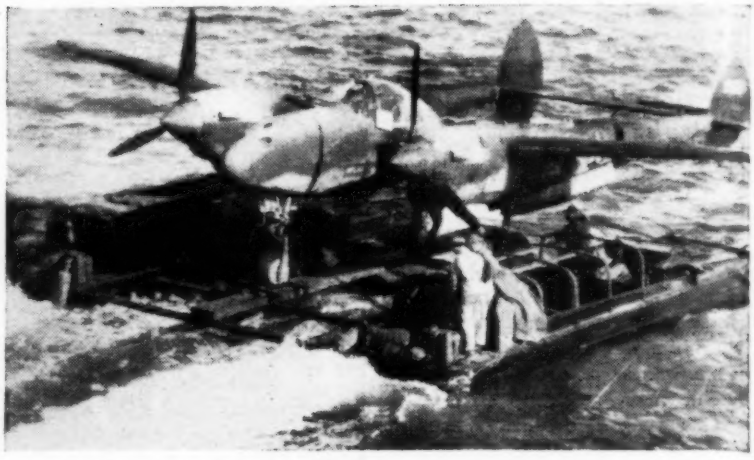
Flt. Lt. D. D. KELTIE, R.A.F.V.R., No. 10 Sqn.
Flt. Lt. D. J. ORAM, R.A.F.V.R., No. 50 Sqn.
Flt. Lt. H. H. PARKER, A.F.M., R.A.F.V.R., No. 51 Sqn.
Flt. Lt. L. O. SIMS, R.A.F.V.R., No. 75 (N.Z.) Sqn.
Flt. Lt. J. E. TAYLOR, D.F.M., R.A.F.V.R., No. 106 Sqn.
Flt. Lt. A. WILLIAMS, D.F.M., R.A.F.V.R., No. 463 (R.A.A.F.) Sqn.
Flt. Lt. E. R. WRIGHT, D.F.M., R.A.F., No. 405 (R.C.A.F.) Sqn.
F/O. R. BETTELEY, R.A.F.V.R., No. 10 Sqn.
F/O. J. R. CARROLL, R.A.F.V.R., No. 103 Sqn.
F/O. J. CHADDERTON, R.A.F.V.R., No. 9 Sqn.
F/O. G. A. CHALMERS, D.F.M., R.A.F., No. 617 Sqn.
F/O. E. DONOVAN, R.A.F.V.R., No. 10 Sqn.
F/O. J. A. DUCKWORTH, R.A.F.V.R., No. 460 (R.A.A.F.) Sqn.
F/O. A. E. EGAN, R.A.F.V.R., No. 156 Sqn.
F/O. J. G. ELDER, R.A.F.V.R., No. 10 Sqn.

Distinguished Flying Medal

Sgt. F. J. CLAY, R.C.A.F., No. 431 (R.C.A.F.) Sqn.
Flt. Sgt. G. C. GILLANDERS, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
Flt. Sgt. E. J. LEFAVE, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
Sgt. O. M. BROWN, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
Sgt. R. E. BUDD, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
Flt. Sgt. B. S. DIXON, R.A.F.V.R., No. 624 Sqn.
Flt. Sgt. A. C. HILLS, R.A.F.V.R., No. 624 Sqn.
Flt. Sgt. H. F. HOLLANDS, R.A.F.V.R., No. 236 Sqn.
Flt. Sgt. J. ROSBOTTOM, R.A.F.V.R., No. 62 Sqn.
Flt. Sgt. J. RODGERS, R.A.F.V.R., No. 235 Sqn.
Flt. Sgt. E. W. TURNER, R.A.F.V.R., No. 150 Sqn.
Flt. Sgt. R. D. BOWERING, R.A.A.F., No. 40 Sqn.
Flt. Sgt. C. R. MCMURDO, R.A.A.F., No. 461 Sqn.
Flt. Sgt. A. R. PATTEN, R.A.A.F., No. 40 Sqn.
Flt. Sgt. F. V. ROBINSON, R.A.A.F., No. 461 Sqn.
Flt. Sgt. A. L. PLIMMER, R.A.F.V.R., No. 101 Sqn.
Flt. Sgt. C. BAUMBER, R.A.F.V.R., No. 97 Sqn.
Flt. Sgt. N. R. BENNETT, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. S. A. BICKNELL, R.A.F.V.R., No. 15 Sqn.
Flt. Sgt. J. S. CADDEN, R.A.F., No. 10 Sqn.
Flt. Sgt. P. R. J. CHILD, R.A.F.V.R., No. 15 Sqn.
Flt. Sgt. W. E. J. COX, R.A.F.V.R., No. 630 Sqn.
Flt. Sgt. J. D. DAVIES, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. W. DONOVAN, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. R. W. FLOWER, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. R. A. HAMMERSLEY, R.A.F.V.R., No. 57 Sqn.
Flt. Sgt. P. HENSER, R.A.F., No. 514 Sqn.
Flt. Sgt. P. N. HOWDLE, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. H. J. HULL, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. G. B. KENDAL, R.A.F.V.R., No. 77 Sqn.
Flt. Sgt. J. W. MCCABE, R.A.F.V.R., No. 115 Sqn.
Flt. Sgt. E. W. MORONEY, R.A.F.V.R., No. 51 Sqn.
Flt. Sgt. R. J. NICHOLAS, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. D. P. PEIRSON, R.A.F.V.R., No. 50 Sqn.
Flt. Sgt. G. N. PERELLA, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. N. PITTAM, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. A. J. H. POLMEAR, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. R. BROOKS, R.C.A.F., No. 77 Sqn.
Flt. Sgt. C. E. CALLAS, R.C.A.F., No. 525 Sqn.
Flt. Sgt. P. S. BAKER, R.N.Z.A.F., No. 57 Sqn.
Flt. Sgt. J. APPLEBY, R.A.F.V.R., No. 267 Sqn., Mediterranean Allied Air Forces.
Flt. Sgt. E. G. S. SCUTT, R.A.F.V.R., No. 207 Sqn.
Flt. Sgt. J. W. SHORT, R.A.F.V.R., No. 50 Sqn.
Flt. Sgt. E. SUTTON, R.A.F.V.R., No. 77 Sqn.
Flt. Sgt. A. T. W. WALKER, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. L. G. WEBSTER, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. T. WELDING, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. W. WOOLLEY, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. K. WOOD, R.A.F.V.R., No. 10 Sqn.
Sgt. C. G. BARLEY, R.A.F.V.R., No. 10 Sqn.
Sgt. J. H. BEECH, R.A.F.V.R., No. 10 Sqn.
Sgt. W. R. BOOKER, R.A.F.V.R., No. 10 Sqn.
Sgt. N. J. BRADLEY, R.A.F.V.R., No. 166 Sqn.
Sgt. F. BYWATERS, R.A.F.V.R., No. 10 Sqn.
Sgt. A. DABBY, R.A.F., No. 50 Sqn.
Sgt. E. C. J. GARDNER, R.A.F.V.R., No. 10 Sqn.
Sgt. G. HACKETT, R.A.F.V.R., No. 10 Sqn.
Sgt. A. HARDING, R.A.F.V.R., No. 166 Sqn.
Sgt. A. G. HOLYOAK, R.A.F.V.R., No. 166 Sqn.
Sgt. C. H. C. MADDISON, R.A.F.V.R., No. 578 Sqn.
Sgt. R. W. PITTAWAY, R.A.F.V.R., No. 622 Sqn.
Sgt. P. STEPHEN, R.A.F.V.R., No. 12 Sqn.
Sgt. J. WITTER, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. (now P/O.) J. KYLE, R.A.F.V.R., No. 197 Sqn.
Flt. Sgt. H. W. ROBINSON, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
Sgt. L. J. CHAMPION, R.C.A.F., No. 57 Sqn.

Army Air Corps

THE KING has been graciously pleased to approve the following awards in recognition of gallant and distinguished services in Normandy:—



CIRCUS ACT: Transporting a Lockheed Lightning from ship to shore by putting one leg into each of two amphibious "ducks."

Bar to Distinguished Flying Cross

Capt. (temp. Maj.) J. A. DALE, D.F.C., Army Air Corps.

Distinguished Flying Cross

Capt. (temp. Maj.) E. D. V. PRENDERGAST, Royal Regiment of Artillery.
Lt. A. E. PICKWOOD, Army Air Corps.
Lt. T. W. TAYLORSON, Army Air Corps.

Distinguished Flying Medal

S./Sgt. E. J. BAKER, Army Air Corps.
S./Sgt. R. BANKS, Army Air Corps.
S./Sgt. E. ENGLAND, Army Air Corps.
S./Sgt. W. C. HERBERT, Army Air Corps.
S./Sgt. P. A. HOBBS, Army Air Corps.
S./Sgt. R. A. HOWARD, Army Air Corps
S./Sgt. S. PEARSON, Army Air Corps.
S./Sgt. J. H. WALLWORK, Army Air Corps.

THE KING has been graciously pleased to approve the following award in recognition of gallant and distinguished services in Italy:—

Distinguished Flying Cross

Lt. (temp. Capt.) H. W. SIMMS, Royal Regiment of Artillery.

THE KING has been graciously pleased to approve the following awards in recognition of gallant and distinguished services in North West Europe:—

Distinguished Service Order

Maj. (temp. Lt. Col.) I. A. MURRAY, Army Air Corps.

Military Cross

Capt. (temp. Maj.) J. F. LYNE, Army Air Corps.
Capt. (temp. Maj.) G. E. SMITH, Army Air Corps.
Lt. R. N. FRY, Army Air Corps.
Lt. T. E. MILLER, M.M., Army Air Corps.
Lt. H. C. POND, Army Air Corps.

Distinguished Conduct Medal

W/O.2 (C.S.-M.) J. MCPARLAN, Army Air Corps.
Sgt. P. J. MCCAMBRIDGE, Army Air Corps.

Military Medal

W/O.2 (C.S.-M.) (act. W/O.1 (R.S.-M.)) G. D. MILLER, Army Air Corps.
W/O.2 (C.S.-M.) B. MACGUINNESS, Army Air Corps.
C. Q.-M.-S. L. A. GRAHAM, Army Air Corps.
Sgt. E. A. LUCAS, Army Air Corps.
Sgt. P. MCGEEVER, Army Air Corps.
Sgt. P. R. O'CONNELL, Army Air Corps
Sgt. A. G. READING, Army Air Corps.
Sgt. J. SANDERSON, Army Air Corps.
Cpl. (act. Sgt.) W. E. M. LITTLEWOOD, Army Air Corps.
Cpl. (act. Sgt.) R. H. MAYHEW, Army Air Corps.
L./Sgt. J. T. BULLOCK, Army Air Corps.
Cpl. J. MCGUINNESS, Army Air Corps.
L./Cpl. H. E. EAGLEN, Army Air Corps.
Pte. A. LEWIS, Army Air Corps.
Pte. J. MILLWARD, Army Air Corps.
Pte. H. STEVENSON, Army Air Corps.
Pte. E. TRAYNOR, Army Air Corps.

Roll of Honour

Casualty Communiqué No. 440.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 76 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Flt. Lt. D. S. Barnes; F/O. N. S. Cooper.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. H. L. Beesley; Sgt. T. A. Bird; Sgt. G. R. Frazer; Sgt. C. Horton; Flt. Sgt. H. V. Mason; Sgt. G. J. Palmer; Sgt. C. G. Perides; Sgt. C. Platt; Flt. Lt. F. E. G. Rashleigh, D.F.C.; Sgt. R. Steventon.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. L. P. E. Allais; Sgt. E. S. Andrew; Sgt. D. R. C. Appleyard; Flt. Sgt. J. G. Aston; Sgt. L. Austin; Sgt. T. Austin; Sgt. L. Balich; Flt. Sgt. F. Ball; Sgt. G. K. Barnes; Sgt. W. H. Boyes; Flt. Sgt. G. W. Bridgewater; Act W/O. A. Berry; F/O. N. H. Cain; Sgt. F. G. Calway; P/O. K. E. Chislett; Sgt. A. Colbourne; Sgt. K. J. Cork; Sgt. J. R. Cowen; Sgt. G. N. Cox; Sgt. D. R. L. Crapper-Bovey; Sgt. W. Dickie; Flt. Sgt. R. E. Doddington; P/O. C. J. L. Dunlop; Sgt. K. P. Froud; Sgt. F. H. Gage; Sgt. D. H. Goldstein; Flt. Sgt. P. B. Green; Flt. Lt. P. A. W. Gwynne; F/O. F. R. Heeley; Flt. Sgt. C. W. H. Heels; Sgt. K. Herring; Flt. Sgt. E. Heweston; Flt. Sgt. J. P. Hey; Sgt. G. H. C. Horne; Flt. Sgt. R. J. G. Hyndson; F/O. O. B. James, M.M., D.F.M.; Sgt. J. Kirby; Sgt. D. McLean; Sgt. L. F. Manley; Sgt. A. J. Murtagh; Sgt. C. S. Nelson; Sgt. A. J. Pollitt; W/O. H. W. Robinson; Sgt. J. Spiers; Sgt. J. E. Taylor; Sgt. A. Turner; F/O. J. E. Watts; Flt. Sgt. E. A. Worrall.

WOUNDED OR INJURED IN ACTION.—Flt. Lt. A. H. Harland.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. F. T. Oliver.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. J. Cuffey; F/O. H. H. G. Davis; Sgt. C. Howard; P/O. K. R. Mead, D.F.M.; Flt. Lt. E. R. Moseley; Flt. Sgt. A. J. Osborne; Flt. Sgt. W. Smith.

MISSING.—F/O. J. A. Adams-Langley; Sgt. A. Allan; W/O. L. J. Anstee; Sgt. R. J. Atkin; Sgt. E. G. Banks; Sgt. D. H. V. Barnes; P/O. A. C. Beattie; Sgt. F. W. W. Beckwith; Sgt. H. Beeson; Sgt. T. Bell; Sgt. H. Bradley; Sgt. D. Brazier; Cpl. A. Brown; Flt. Sgt. I. A. Buchanan; Sgt. K. E. Chandler; Sgt. F. H. W. Coles; Sgt. R. A. Conde; Sgt. S. H. Cook; Flt. Lt. H. T. D. Cooper; Flt. Sgt. J. L. Cox; Sgt. E. C. Day; W/O. J. Dickinson; P/O. J. Docherty; Act. F/O. H. F. Dod; Sgt. K. S. F. Dossett; P/O. R. W. Egleton; Sgt. H. F. Eveleigh; F/O. W. F. Freeman; Flt. Sgt. A. McW. Frew; Flt. Sgt. F. A. Giles; F/O. A. Gill; Flt. Sgt. R. Gledstone; Flt. Sgt. P. E. Godsell; Sgt. W. J. Goodyear; Flt. Sgt. N. Gordon; Flt. Sgt. V. H. Grayson; F/O. L. R. Hannah; Sgt. F. H. Hard; Flt. Sgt. W. Hargreaves; Flt. Sgt. F. Hartley; Sgt. L. Horner; Sgt. R. Houseman; Sgt. G. R. Howell; Flt. Sgt. L. W. Hughes; Sgt. E. C. Hum; Sgt. T. E. Hunt; Sgt. T. L. Jackson; Flt. Sgt. F. Jeffries; P/O. D. Johnston; Sgt. R. E. Jones; Sgt. V. A. Keen; Sgt. H. J. Kelly; F/O. J. W. Kelly; Sgt. H. S. Kilsby; P/O. M. Livesey; Flt. Sgt. N. Macpherson; Flt. Sgt. S. E. W. Marshall; Sqn. Ldr. T. O. Marshall, D.F.C.; Sgt. D. G. Mayley; Sgt. J. Mercer; Sgt. L. E. G. Pester; Flt. Sgt. R. G. Pocock; P/O. J. Rathbone; Flt. Sgt. F. A. Read; P/O. J. W. C. Reeve; Flt. Sgt. A. G. Rhodes; Sgt. D. H. Robinson; Sgt. A. E. J. Rouse; Sgt. A. Rowe; Flt. Lt. F. D. Rumble; P/O. D. W. Ryan; Sgt. B. R. Scott; Sgt. J. McD. Shaw; Sgt. J. R. Sissons; Flt. Sgt. F. S. Sparrow; Sgt. W. A. Steel; P/O. R. N. Taft; F/O. R. J. Taylor; Sgt. J. T. Theaker; Sgt. J. E. Turnbull; Sgt. E. Turner; Sgt. G. H. Tyler; Flt. Sgt. P. G. Uren; F/O. W. D. Walden; F/O. F. E. Wareham; Sgt. J. Warrington; Sgt. E. G. Waters; Sgt. J. T. Welsh; P/O. R. J. West; Sgt. L. G. White; Sgt. R. W. Whitelam; Sgt. E. Wilkinson; Sgt. C. F. Wilson; Sgt. D. G. Wood; Flt. Sgt. J. A.

Wooldridge; Sgt. J. D. Yole; F/O. L. C. Zeffertt.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—A/C.1 J. J. Douglas; Sgt. J. E. Milnes.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. G. V. J. Bell; Flt. Sgt. E. R. J. Blezard; Flt. Lt. N. J. Bonnar, A.F.C.; Flt. Lt. O. A. Budgell; F/O. C. R. Dodwell; F/O. S. J. Drennan; F/O. H. O. Fairbairn; Sgt. F. H. W. Finch; Flt. Lt. R. E. Gabbitas; F/O. W. G. Hislop; W/O. S. P. Lewis; Cpl. C. L. Mahoney; Sgt. A. J. Milton; Sgt. H. O'Reilly; F/O. G. W. C. Smith; Flt. Sgt. A. F. Standring; Sgt. L. G. Starnes; F/O. J. A. Wyatt.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. L. C. Cockren.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. F. W. Shirley.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. J. E. Applegate; Cpl. F. W. Askew; A/C.2 K. C. Ball; Flt. Sgt. A. Biffen; L.A/C. R. E. Blissett; L.A/C. T. H. Clarke; Sgt. W. K. Dalton; A/C.1 D. I. Hamer; L.A/C. W. P. Higson; A/C.1 A. Griffith; L.A/C W. R. Lassetter; F/O. D. Mackenzie; L.A/C. A. W. R. Philbrook; Flt. Sgt. D. Salton; L.A/C. L. F. Sulsh; A/C.1 W. R. Webber; L.A/C. H. R. E. Wright.

DIED ON ACTIVE SERVICE.—L.A/C. J. B. Allwood; L.A/C. W. Carruthers; L.A/C. A. Cranson, Sgt. L. W. Dunne; L.A/C. A. M. Edwards; Sgt. T. A. Firth; P/O. J. E. Fox; Sgt. R. W. Gardiner; A/C.2 A. N. Gurney; Cpl. A. F. Hart; L.A/C. R. T. Hookway; L.A/C. C. L. Ingram; Sgt. S. R. Life; L.A/C. D. E. McCandless; A/C.2 J. MacWilliam; Cpl. H. Martin; L.A/C. D. W. Muggridge; F/O. D. A. Nicol; Sgt. T. M. Oldfield; A/C.2 E. G. Parker; A/C.2 J. P. Powell; L.A/C. J. F. Sharples; L.A/C. L. F. Strutt; A/C.1 C. Williams; L.A/C. H. Williams.

Women's Auxiliary Air Force

KILLED ON ACTIVE SERVICE.—A/CW.1 M. Savage.

SERVICE AVIATION

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. A. McD. Lindsey.

WOUNDED OR INJURED IN ACTION.—W/O. A. W. Emslie; F/O. H. R. Stannus.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. G. E. Nash; Flt. Sgt. R. A. L. Reid; Flt. Sgt. C. D. Ryalls; Flt. Sgt. G. M. Walker.

MISSING.—P/O. L. R. Abrahams; Flt. Sgt. W. J. Adcock; Flt. Sgt. K. L. T. Dickerson; Flt. Sgt. A. B. Hart; Flt. Sgt. G. H. Hunkin; P/O. J. L. Israel; W/O. R. F. Love; F/O. P. J. O'Leary; P/O. R. H. Passant; F/O. A. F. Paton; W/O. J. E. Snaddon; W/O. L. J. Thompson; Flt. Sgt. W. Tudberry; P/O. W. A. H. Vaughan; F/O. I. M. Yeates; P/O. W. A. Young.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Flt. Sgt. J. T. Andrew; Flt. Sgt. J. C. Grant; Flt. Sgt. M. M. Roberts.

KILLED ON ACTIVE SERVICE.—Act. Flt. Lt. L. R. Brady; Flt. Sgt. J. C. Chenu; Flt. Sgt. I. J. Flynn.

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Sgt. H. G. Dimock.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. G. W. Speicher.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. G. R. Bourdon; Flt. Sgt. J. E. Couch; Flt. Sgt. W. E. Gimby; P/O. G. N. Goodwin; P/O. F. S. Green; P/O. O. D. Harrison; Sgt. A. V. D. Humphries; Sgt. H. A. Huntington; Sgt. J. L. L. Janisse; Sgt. D. J. McCarty; Flt. Sgt. R. E. May; Act. Flt. Lt. D. McN. Moodie; W/O. M. E. Varney; W/O. F. B. Watson.

WOUNDED OR INJURED IN ACTION.—F/O. W. J. Snow.

MISSING, BELIEVED KILLED IN ACTION.—F/O. G. W. Ferguson.

MISSING.—Flt. Lt. E. A. Armstrong; Flt. Sgt. H. Atkin; P/O. H. W. Birnie; P/O. L. D. Bonnett; F/O. H. Braathen; W/O. J. A. Buckingham; Flt. Sgt. J. A. Buckingham; W/O. L. W. Burnside; Sgt. F. A. Coady; Flt. Sgt. D. M. Corbett; F/O. J. R. Daly; Sgt. W. C. Ellis; P/O. T. G. Evans; F/O. F. N. Hack; P/O. C. I. Jakeman; F/O. D. S. Jamieson; F/O. W. Jamieson; Sgt. T. Krynski F/O. T. B. McAneney; W/O. E. D. McDermid; W/O. R. J. J. McFadden; Flt. Sgt. G. E. Moore; Sgt. D. More; F/O. C. A. Moss; F/O. L. F. O'Brien; P/O. R. L. Porter; Sgt. W. W. Rennie; P/O. T. A. Rogers; Sgt. A. G. Sinclair; F/O. R. H. Sneath; F/O. L. T. Sykes; P/O. J. R. Truscott; F/O. P. N. T. Van Alstyne; Flt. Sgt. D. Wallbank; F/O. J. R. Willis.

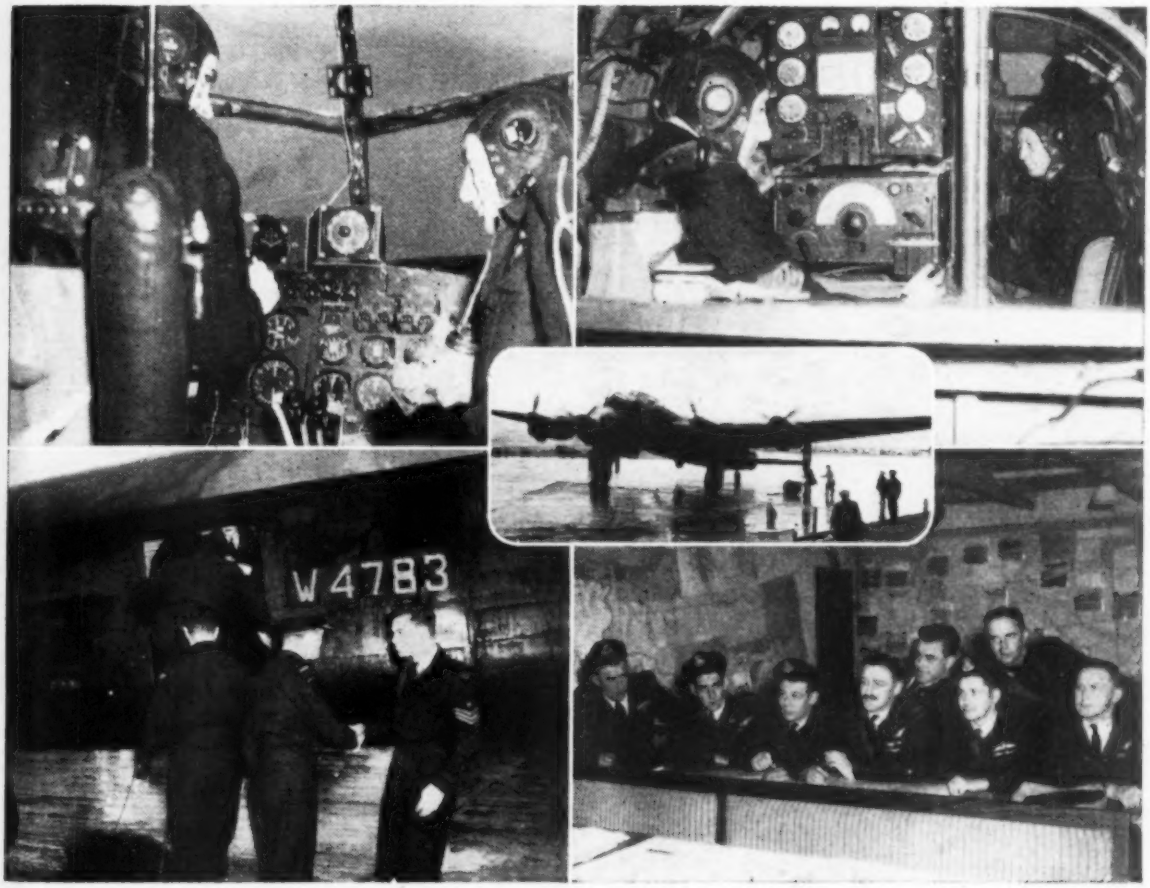
KILLED ON ACTIVE SERVICE.—Flt. Lt. F. L. Burston; F/O. G. R. Burston; P/O. D. G. Bush; F/O. R. V. Doupe; Sgt. N. S. Hurder; Sgt. O. Miller; Flt. Lt. J. L. G. Wates.

Royal New Zealand Air Force

MISSING.—W/O. D. L. Burke; Flt. Lt. J. V. Patrick; W/O. B. Ward.

South African Air Force

MISSING.—W/O. W. S. Barret; Lt. A. N. Beaumont; 2/Lt. J. P. Blanc; Lt. H. H. Bounce; W/O. R. Brice; Lt. W. H. Clack; Lt. D. W. Dodd; Lt. E. G. Ellio-Wilson; Lt. D. Fietee; W/O. D. T. Flynn; Lt. D. J. S. Haggie; Lt. D. C. Henriksen; Lt. D. R. Hielm; 2/Lt. D. Lindley; Lt. G. B. Marquard; W/O. T. S. Miles; 2/Lt. V. B. Mills; Maj. J. A. Mouton, D.F.C.; W/O. J. M. Z. Posthumus; Capt. R. H. Povey; 2/Lt. R. G. Southey; 2/Lt. E. G. B. Stewart; W/O. G. W. H. Trezona; Capt. T. A. M. Van Der Spuy.



FOR DOWN UNDER: G. for George, a R.A.A.F. veteran Lancaster of 90 ops., which is now on its way by air to Australia. It has been presented to the Australian War Museum. (Top left) Flt. Lt. E. A. Hydson, D.F.C. and Bar, Captain, and F/O. F. P. Smith, D.F.C., Second Pilot. (Top right) F/O. C. H. Tindale, D.F.M., Radio Operator, and F/O. W. C. Gordon, D.F.C., Navigator. (Bottom left) Air Vice-Marshal H. N. Wrigley, C.B.E., D.F.C., A.F.C., A.O.C. R.A.A.F. Overseas H.Q., saying good-bye to Flt. Sgt. H. Tickle who has been in charge of maintenance the whole time. (Bottom right) The final briefing for the 13,000 mile journey to Australia via Canada and the United States.

Casualty Communiqué No. 441

Of the names in this list 76 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Flt. Lt. G. L. Barker; Sgt. D. H. Bowdige; Sgt. F. Myers; Sgt. C. J. Owen; Flt. Lt. C. A. Pain; Flt. Sgt. P. L. Pallett; Flt. Sgt. D. G. Passmore; F/O. K. F. Pattison; Sgt. S. W. Smith; Sgt. T. E. Sunley; Sgt. R. Winterburn.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. E. A. Alliston; Sgt. H. R. Batten; Flt. Sgt. H. F Bryson; Sgt. F. J. Dimond; F/O. A. W. Gadd; Flt. Lt. G. Goldsmith; Sgt. K. Holt; F/O. E. Lister; F/O. J. R. Moore; Sgt. S. A. Robbins; Sgt. G. F. W. Stephens; P/O. R. Stott, D.F.M.; Flt. Sgt. D. Walsh; Sgt. R. D. Yates.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. G. E. Aldous; Sgt. J. L. Brent; Sgt. E. A. Brinton; P/O. J. W. Brown; Sgt. A. B. Brunton; F/O. S. G. Burnham-Richards; Sgt. P. Cassidy; P/O. J. Clapperton; Flt. Sgt. G. F. Clark; Act. Flt. Lt. E. J. Clement, D.F.C.; Flt. Sgt. W. C. Connor; Sgt. L. H. Cooper; Sgt. T. R. Ewan; Sgt. P. J. Flower; F/O. C. W. Foster; Sgt. E. J. Francis; Sgt. R. C. H. Freeman; Sgt. S. T. Hazel; Sgt. H. J. Henshall; Act. Flt. Lt. J. Hough, D.F.C.; F/O. W. R. King; Sgt. R. Littlehales; Sgt. W. J. G. Middleton; Sgt. E. Milling; Flt. Sgt. A. E. Naylor; P/O. F. A. G. Parker; Sgt. C. H. Pell; Sgt. J. M. Phillips; Flt. Lt. J. Rintoul; Sgt. M. G. Smallridge; P/O. L. A. Smith; Sgt. W. H. Stagg; Flt. Sgt. T. E. Stamp; Sgt. J. T. Sykes; Sgt. F. Thomas; P/O. S. P. I. Thomas; Sgt. R. Thompson; Sgt. J. P. Todd; P/O. T. J. P. Walsh; P/O. J. F. B. White; Sgt. J. P. Williamson.

WOUNDED OR INJURED IN ACTION.—Sgt. M. H. Collings; Flt. Lt. J. G. Mansfield.

MISSING, BELIEVED KILLED IN ACTION.—F/O. N. Bage; Flt. Sgt. R. R. Blair; P/O. F. C. Hampton; Sqn. Ldr. the Hon. F. H. L. Scarlett; F/O. D. I. N. G. Sinclair; Sgt. C. D. Woodruff.

MISSING.—Sgt. A. R. Albery; Sgt. H. Allen; Sgt. A. A. Ansell; Sgt. J. T. Ash; P/O. R. J. Aubrey; Sgt. K. G. Barnett; P/O. G. Baxter; Sgt. D. Betterton; Flt. Sgt. N. S. Birch; Sgt. R. J. Bocking; Sgt. D. C. Brennan; Sgt. A. C. Brown; P/O. J. N. Brown; Flt. Lt. J. A. Bulcraig; Sgt. K. D Burroughs; F/O. J. W. Cameron; Sgt. D. J. C. Carling; F/O. G. W. Cash; Flt. Sgt. G. Chaffe; Sgt. S. Clubb; Flt. Sgt. G. A. C. Coldridge; Flt. Lt. J. G. Cooke; Flt. Lt. E. Cooper; Sgt. W. R. Cowan; Sgt. J. R. Cowell; Sgt. R. B. Cox; Act. Flt. Lt. G. S. Cruden; Sgt. A. E. Curtin; F/O. W. R. Cuthbertson; Act. Sqn. Ldr. E. G. Daniel, D.F.C.; F/O. R. B. Daniel; Sgt. T. Davies; Flt. Sgt. C. Davison; Flt. Sgt. W. E. Dearden; Sgt. C. Dickinson; Sqn. Ldr. T. E. Dodwell, D.F.C.; Sgt. T. D. Duggan; F/O. F. J. Dyer; Flt. Lt. D. Edyvean; Sgt. L. C. Ekers; Sgt. A. J. Elworthy; Flt. Sgt. D. J. Evans; Flt. Sgt. J. Ferguson; Flt. Sgt. G. D. Fowell; Sgt. L. Freyne; Flt Sgt. N. L. E. Gale, D.F.M.; F/O. B. R. Garnett; Sgt. R. P. Gatensbury; Sgt. J. Gill; F/O J. R. Green; F/O. P. T. Green; Flt. Sgt. A. W Habergham; P/O. E. Hall; Flt. Lt. D. R. Hall; Flt. Sgt. R. Hamilton; Sgt. G. E. D. Hands; Sgt. K. Hannell; Sgt. F. Hardy; Sgt. C. A. Harris; Sgt. D. J. Hatchett; Sgt. E. W. Hayes; Sgt. D. Henderson; Sgt. T. Hendry; P/O. L. Honor; Sgt. W. T. R. Hunter; Flt. Sgt. D. M. Jones; Sgt. L. L. Kay; F/O. B. A. Lambert; Act. Sqn. Ldr. G. F. Lambert, D.F.C.; Sgt. M. Loosli; Sgt T. Loughlin; F/O F. J. Lynam; Sgt. T. Lyth, Sgt. J. M. McCarthy; Sgt. A. McKenzie; Sgt. A. H. Mabey; Sgt. W. J. Marks; Sgt. J. E. Massey; Sgt. F. Meade; Act. Flt. Lt. F. X. Merrick; Sgt. J. F. Molloy; Flt. Sgt. L. Morgan; F/O. A. W Munro; P/O R. Murphy; Flt. Sgt. H. R. Neal; Flt. Sgt. R. H. Norman; Sgt. W. Offord; Sgt. J. W. Perkins; F/O. O. H. Pollard; F/O. J. Poulter; Flt. Sgt. M. G. Price; Sgt. G. W. Pusey; Sgt. S. O. Reneau; Flt. Lt. R. W. Reynolds; P/O. D. C. Rippon; Sgt. G. H. Robinson; F/O. E. C. Robson; Flt. Sgt. L. C. Roots; Sgt. A. Ross; Act Flt. Lt. F. D. Round, D.F.M.; F/O. E. H. Ruston; Sgt. F. Ryder; F/O. F. Salt; W/O. K. Scholes; Sgt. T. I. Scott; Sgt. F. S. Seymour; F/O. A. R. P. Shields; Sgt. R. A. Smith; Flt. Sgt. D. W. Snell; Sgt. R. D. Stack; F/O. P. F. Sturges; Sgt. P. A. Tarlton; Sgt. A. P. Tarr; Sgt. R. J. Taylor; Sgt. J. W. Thomas; Sgt. W. L. Thompson; Sgt. G. T. Tipping; Sgt. J. Todd; Sgt. N. Walters; Sgt. R. Watson; Sgt. B. J. Watts; Sgt. C. G. Wenyon; Flt. Lt. G. K. Whiffen; Sgt. B. Whitehead; Sgt. D. R. R. L. Whitfield; Flt. Sgt. F. A. Wilkinson; F/O. D. E. Williams, D.F.C.; Sgt. T. W. Willis; F/O. E. Wright.

KILLED ON ACTIVE SERVICE.—W/O. R. Blair; Flt. Lt. W. D. Brown, D.F.C.; P/O. E. F. Cockcroft; W/O S. P. Edge; W/O. J. Everett, D.F.M.; Cpl. C. D. Faithful; P/O C. A. C. Forester; Sgt. A. Gill; F/O. G. E. Hobdell; Flt. Lt. R. W. Lord; Flt. Lt. A. C. Shilleto; F/O. H. R. Strange; Flt. Sgt. H. A. Wiles; Flt. Sgt E. M. Young.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. C. F. Knapp; Sgt. S. W. Parr; Sgt. A. Robertson.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED

IMPUDENCE : Fitting R. P. tubes to the wing struts of an artillery-spotting Piper Cub. There is no recoil from rocket projectiles and, therefore, no extra stresses are set up.

KILLED ON ACTIVE SERVICE.—P/O. J. L. Atkinson.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. R. H. Casburn; Sgt. T. Morgan; Flt. Lt. R. M. Oliver; Cpl. C. H. Rocke.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. R. Jackson.

DIED ON ACTIVE SERVICE.—P/O. M. J. Berry; L.A/C. P. Burke; L.A/C. C. H. Cartmale; L.A/C. J. P. Dowds; L.A/C. F. E. Gaston; Sgt. N. B. Gibbs; Cpl. R. F. Hall; Sgt. T. A. Holt; Sgt. A. L. Hulse; L.A/C. K. N. Murray; Cpl. C. T. Ransom; A/C.1 A. E. L. Rogers; L.A/C. W. R. Swain; Sgt. P. J. Walsh.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. N. Harland; Flt. Sgt. H. H. W. Middleton; Flt.; Lt. D. L. Porter; Flt. Lt. H. R. G. Poulton, D.F.C.; Flt. Sgt. F. A. Sturges.

Women's Auxiliary Air Force

KILLED ON ACTIVE SERVICE.—L.A/CW. E. M. Kerly.

Royal Australian Air Force

KILLED IN ACTION.—W/O. B. G. Blatch; P/O. R. A. P. Brown; W/O. L. C. Degaris; P/O. A. S. Rooke.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. E. Harrison.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. F. J. Clerke; F/O. C. F. Cox; Flt. Sgt. G. S. Fairbairn; F/O. W. N. Hill; Flt. Sgt. B. F. Sedgley; Flt. Sgt. L. B. York.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. H. A. Cummins; Flt. Sgt. G. G. Podosky; Act. Sqn. Ldr. R. A. Willis, D.F.C.

MISSING.—P/O. A. K. Carter; F/O. A. A. Connor; Flt. Sgt. J. K. Cory; Flt. Sgt. G. E. Dowling; Flt. Sgt. P. Dunford; P/O. J. P. Estell; F/O. E. G. Fletcher; Flt. Sgt. A. O. Gillett; W/O. L. Harrison; Flt. Sgt. J. A. Holland; P/O. S. R. James; P/O. J. R. Jones; Flt. Sgt. C. V. Krieg; Flt. Sgt. A. H. Lawry; W/O. J. A. McDonald; F/O. M. J. McLeod; Flt. Sgt. T. F. Maher; Flt. Sgt. N. W. Miles; P/O. F. F. Molinas, D.F.C.; F/O. F. E. O'Connell; Flt. Sgt. J. Pritchard; P/O. H. S. K. Ross; Flt. Sgt. A. J. Routley; Flt. Sgt. A. Roxby; P/O. N. E. Webb; Flt. Sgt. W. G. R. Whimpey.

WOUNDED OR INJURED ON ACTIVE SERVICE.—W/O. A. H. Firth.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. E. J. Keefe; F/O. H. M. Romuld; Sgt. W. P. Smith; P/O. B. I. G. Steed; P/O. A. D. Telford.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. R. W. Briggs-Jude; Flt. Sgt. J. D. Este; Sgt. S. E. Towle.

WOUNDED OR INJURED IN ACTION.—Sgt. M. J. P. Lavoie; Flt. Sgt. R. H. Rae.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—P/O. D. E. Horton.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Lt. W. A. Black, A.F.C.

MISSING.—F/O. E. M. Andrew; F/O. R. N. Bartlett; F/O. W. B. Beatty; F/O. F. C. Bremner; Sgt. A. T. Couch; Sgt. J. A. Cunningham; F/O. R. H. Dickinson; F/O. E. W. Folliott; Sgt. G. H. Isaac; F/O. G. W. Johnson; Sgt. F. E. Joynson; Flt. Sgt. J. Kawucha; F/O. F. H. Moxon; Sgt. W. W. Ozeroff; Flt. Sgt. J. B. Patterson; P/O. B. A. McK. Rutherford; Flt. Sgt. D. Sebeystyen; Flt. Sgt. D. A. Taylor; Sgt. D. Urquhart; Flt. Sgt. H. P. Warll; W/O. N. H Wettlaufer; P/O. S. Young.

KILLED ON ACTIVE SERVICE.—W/O. G. F Kingsbury.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Act. Flt. Lt. F. L. Perrers; F/O. G. E. Rawson.

WOUNDED OR INJURED IN ACTION.—F/O. L. H. Johnston; P/O. C. J. Sheddan.

MISSING.—F/O. R. C. Beazer; W/O. R. F. Cottrell; W/O. T. D. De Renzy; Act. F/O. W. R. Green; P/O. M. C. Hollard; Act. F/O. T. G. Page.

KILLED ON ACTIVE SERVICE.—W/O. L. H. Johnson

South African Air Force

KILLED IN ACTION.—2/Lt. C. A. Harris; Lt. J. A. Holt; Lt. V. E. Westerveck; Lt. N. W. Witt.

MISSING.—Lt. J. E. Andrews; Capt. R. B. Bird; Lt. R. W. Harris; Lt. E. I. Nicholson; 2/Lt. E. Nowers; W/O. L. A. Preston; W/O. J. V. Robertson.

Air Transport Auxiliary

Third Officer Edward Easton Vergette, A.T.A., KILLED whilst ferrying His Majesty's aircraft in England.

Official Corrections

Casualty Communiqué No. 437.

Under "MISSING" for Sgt. L. B Dawson read P/O. L. B. Dawson, R.A.A.F.

Under "MISSING" delete F/O. H. K. Nunn, R.C.A.F.

Under "PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION" for P/O. D. B. Surrette read F/O. D. B. Surrette.

Under "MISSING" delete P/O. N. P. Murphy.